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DISEASES CAUSED BY BACTERIA AND FUNGI.

- I. CERNAIANU, C. (1932). A propos de la mise en évidence de l'action des microbes sur les sucres. [**The Identification of Bacteria by their Action on Sugars**].—*G. R. Soc. Biol. Paris*. **109**. 246-248. [1 ref.]
- II. CASTELLANI, A. (1932). **The Amœbo-Test as an Additional Method of differentiating Certain Bacteria.**—*Trans. Roy. Soc. Trop. Med. Hyg. London*. **25**. 219. [4 refs.]
- III. STENSTROM, W., & GAIDA, J. B. (1931). **Action of Ultra-Violet Rays in New and Old Bacterial Cultures.**—*Proc. Soc. Exp. Biol.* **28**. 898-902. 2 tables.

I. The author advocates 0·5 per cent. of the necessary carbohydrate with brom-thymol blue as indicator when testing the fermentation reactions of various bacteria.

II. By subculturing a week-old culture of an amœba, which was first found as a parasite of a cryptococcus, on to the centre of an agar culture of certain bacteria, the author has shown that zones of clearing occur with some bacteria and not with others. The dysentery bacteria and *Bact. typhosum* give a positive reaction whilst members of the brucella group, *Vibrio cholerae* and others, give a negative reaction. Certain strains of *Bact. coli* give a doubtful reaction.

III. Cultures of *Bact. coli communis* of varying age were irradiated with a quartz mercury arc lamp for three quarters of a minute. It was found that young cultures which had been grown for 24 hours only were much more resistant to the action of the rays than old cultures which had remained in a sealed condition for over 30 days. It was found in subsequent experiments that the resisting powers to ultra-violet rays were quickly built up by subculturing. Cultures grown for 24 hours have the greatest resistance. When they are transplanted, their resistance falls and increases again rapidly.

R. LOVELL.

GROSS, Hans. (1931). Der Plasmagerinnungsstoff der Staphylokokken. [**The Coagulens produced by Staphylococci**].—*Zlb. Bakt. I. (Orig.)*. **122**. 354-361. 3 tables. [11 refs.]

The coagulation power possessed by pyogenic cocci was first described by MUCH, in 1908, who attributed the action to a specific ferment which he called staphylokinase. Since that date a number of investigators have carried out tests with staphylococci and other organisms, but the results have not always been concordant. Gross thinks it is improbable that a ferment of the thrombokinasase type is actually concerned in the reaction.

As the subject had been investigated somewhat incompletely by other authors, he tested filtrates of staphylococcus cultures with regard to their coagulating properties in order to arrive at a definite conclusion. The results of these tests confirmed MUCH's view that the power of coagulating plasma possessed by certain strains is a characteristic property of the strains. Experimentally, the substance responsible for the coagulation can be shown to be present in culture filtrates. It is thermostable to the extent that it will resist 90° C. for an hour. Up to the present it has not been found possible to prepare an anti-coagulating serum by the injection of rabbits with active culture filtrate.

The staphylococci used in the experiments totalled 200 strains. On the score of their powers of producing hæmolysis, necrosis and coagulation, they were divisible into three groups, but the distinctions were not sharply defined as they were based upon a progressive diminution in the capacity to produce these reactions. The third group produced no hæmolysis, no skin reaction of any consequence and no coagulation.

A. LESLIE SHEATHER.

DUBOS, René, & AVERY, Oswald T. (1931). **Decomposition of the Capsular Polysaccharide of Pneumococcus Type III by a Bacterial Enzyme.**—*J. Exp. Med.* **54**. 51-71. 8 tables. [14 refs.]

AVERY, Oswald T., & DUBOS, René. (1931). **The Protective Action of a Specific Enzyme against Type III Pneumococcus Infection in Mice.**—*Ibid.* **73-89**. 8 tables. 4 text figs. [10 refs.]

The authors have discovered a specific enzyme capable of decomposing the capsular polysaccharide of pneumococcus type III. This enzyme is a soluble endocellular product of a pleomorphic bacillus isolated from the cranberry bogs of New Jersey by the utilization of "starvation" cultural methods. The enzyme-producing power of the organism was discovered by growing it on a synthetic mineral medium which contained the specific polysaccharide as the sole source of carbon. The precipitin test was used to determine the dissolution of the polysaccharide. The organism grew only under aerobic conditions between a pH of 6.2 and 7.8 at room temperature or at 37.5° C. Its activity was increased by repeated transfer until 0.002 per cent. of the specific substance could regularly be decomposed in 24 hours when a young culture was used. The action was found to be specific for the type III polysaccharide only, having no action even with gum arabic, which substance reacts to type III antiserum. The enzyme was obtained after filtration experiments with cultures of the organism, but only after the cells had been autolysed. It was inactivated by heating for 10 minutes at 60° to 65° C., but acted equally well under aerobic or anaerobic conditions. It is, therefore, not an oxidative enzyme, but it is suggested that its action is one of hydrolysis. It exhibited the same specificity of action as its parent organism, and the authors

titrated its activity by determining the minimum amount required to decompose 1 c.c. of a 0.001 per cent. solution of the specific polysaccharide in 18 hours at 37.5° C.

The authors have also determined the action of the enzyme on type III pneumococcus growing *in vitro* and *in vivo*. The presence of the enzyme in cultures of the pneumococcus deprived the organisms of their capsules without impairing the viability of the cells. When inoculated into mice simultaneously with the specific pneumococcus, the enzyme was found to protect against one million fatal doses of the organism, and when injected 18 hours after infection, it was found to exert a curative action. The protection was specific, not being afforded when heterologous types of pneumococci were injected. It seemed that the concentration of the enzyme was directly related to its protective power.

This work has produced further evidence to support the theory that pneumococcal "type specificity" is due to the capsular polysaccharide and not to some impurity it carries.

NORMAN HOLE.

COOK, R. P. (1931). Some factors influencing spore formation in *B. subtilis* and the metabolism of its spores.—*Zlb. Bakt. I. (Orig.)*. **122**. 329-335. 1 table, 2 figs. [8 refs.]

The author gives details of the various culture media employed for the experiments and the variations introduced into them in the form of salt, various sugars and ranges of hydrogen ion concentration. The cultures were examined with ultra-violet light under dark ground illumination. The conclusion arrived at is that spore formation is not a process related to the development of unfavourable conditions, but to the life cycle of the organism. What that relationship is, has not been determined.

Experiments were carried out in which the respiration of spores and vegetative forms was measured and it was found that, although the respiration of the spores is far less than that of the vegetative forms, it is not negligible. The effect of the addition of sugars upon the respiration of spores and bacilli was also studied and the results obtained are shown by graphs. The hydrogenase and proteolytic activities were examined. The latter was found to be more marked in the spore than in the vegetative stage. The proteolytic action of the spore stage usually results in the lysis of the remaining vegetative forms in an old culture, but this is not an invariable result. In some culture media (liquid) complete autolysis occurs.

The author is not inclined to agree with DARANYI that spore formation is brought about primarily by colloidal reactions.

A. LESLIE SHEATHER.

VIDAL, J., & LOPEZ, G. (1931). Etudes sur la Bactéridie asporagène. [Study of the non-sporulating Forms of *B. anthracis*].—*C. R. Soc. Biol. Paris*. **106**. 1005-1006.

The authors state that, although the existence of non-sporulating forms of *B. anthracis* in cultures has long been recognised, no study of them has yet been undertaken.

The asporogenous form can readily be obtained by serial culture of the organism in broth, on potato soaked in bile or on plates sown from broth cultures. It makes no difference whether the original material contains spores only or whether the heart blood of guinea pigs, in which no spores are present, is used.

In young cultures, the asporogenous bacilli are very similar to the sporulating forms; they appear to be slightly smaller, chains are not so frequently observed and broth cultures show a uniform cloudiness. The virulence of recently isolated asporogenous cultures is equal to that of the sporulating form, but it gradually wanes and finally disappears as the result of subcultivation. The asporogenous form has never been observed to regain the power of sporulating.

T. M. DOYLE.

KAHN, M. C., & SCHWARZKOPF, H. (1931). **Some Biophysical Properties of the Tubercle Bacillus.**—*Amer. Rev. Tuberc.* **23**. 45-55. 1 table. 2 plates. [5 refs.]

After referring briefly to the powers of dissociation of certain strains of tubercle bacilli, the authors discuss some of the differences which exist between the rough and smooth types. The R type has a longer and coarser rod, it grows more rapidly on certain media, has a rough colony which is flatter and duller than that of the S type and it does not form such a uniform suspension.

PETROFF noticed that avian R cultures tend to become S after 8 to 10 passages when grown on media containing anti-R serum, and that the reverse action also takes place in the appropriate conditions.

Using S and R avian and bovine strains, the authors describe experiments to show that these two types also differ in their (electrophoretic) mobility velocities and in certain growth phenomena. The average mobility velocities for a number of strains, which were found by cataphoresis, are given in microns per second. The velocity is higher in the case of the S types.

The growth rate and colony formation were studied by micro-culture methods in micro-droplets inoculated with 15 to 30 organisms of the same type. The entire phenomenon of growth of an R avian strain was more rapid than that of the S type. The lag phase was shorter, growth was apparent at the end of the fifth day and differences could be seen by the tenth day. Whilst R organisms produced a coarse filamentous network, a number of S organisms were dispersed throughout the droplet and only formed very fine network in the later stages.

When grown in their homologous antisera, practically no growth occurred up to the 45th day and, whilst the heterologous anti serum had no effect, the addition of human serum to the droplet enhanced the growth.

N. BARRON.

OERSKOV, J. (1932). Eine morphologische Untersuchung über das Initialwachstum des Tuberkelbazillus. [**Examination of the Initial Growth of the Tubercle Bacillus**].—*Zlb. Bakt. I. (Orig.)*. **123**. 271-285.

This paper is largely a criticism of KAHN's views regarding the morphological characters of the tubercle bacillus during multiplication. The author describes the technique which he employed in studying the cultural characters of fungi and bacilli. He concludes that KAHN's views are incorrect and that there is no ground for changing the established view regarding the morphology of multiplying tubercle bacilli. He offers suggestions as to the explanation for the appearances observed by KAHN.

A. LESLIE SHEATHER.

NÈGRE, L., & VALTIS, J. (1931). Action des substances ciro-graisseuses du Bacille de Koch sur la multiplication *in vivo* chez le Cobaye, des Bacilles

paratuberculeux et des Bacilles tuberculeux aviaires. [The Action of the Waxy Substances of the Tubercle Bacillus on the Multiplication *in vivo* in the Guinea Pig of saprophytic Acid-fast Bacilli and avian Tubercle Bacilli].—*C. R. Soc. Biol. Paris*. 107. 596-598. [1 ref.]

The authors inoculated guinea pigs subcutaneously with suspensions of saprophytic acid-fast bacilli or with avian tubercle bacilli. Some of them were treated with subcutaneous injections of an acetone extract of tubercle bacilli twice weekly. Multiplication of the acid-fast bacilli in the local lesions and regional lymph-glands of the treated guinea pigs was much greater than in the controls.

R. LOVELL.

BAUMANN, E. (1931). Vorschläge für den weiteren Ausbau der Tuberkulosebekämpfung. [Suggestions for the Further Development of Tuberculosis Control].—*Berl. tierärztl. Wschr.* 47. 584-586.

The author points out the shortcomings of the present system of tuberculosis control in Germany—the voluntary Ostertag method—in which only animals affected with open tuberculosis are removed for slaughter. Infection continues to spread in a herd containing odd animals which, while being suspects, are negative to the bacteriological examination of sputum and are therefore retained in the herd.

In the author's opinion, annual clinical examinations of a herd are much too infrequent; he considers that the entire Ostertag system represents half measures which cannot bring about the extinction of the disease although it is of some value in checking its increase.

The tuberculin test has no general application in the Ostertag method; thus a very valuable complement to the clinical examination is not available. This uncertainty causes perpetual trouble to the cattle owner in connection with the question of compensatory payments for animals condemned.

The author advances the following proposals:—

The work to be known as the "Campaign against Tuberculosis" ("Bekämpfung") and not as hitherto "Elimination of Tuberculosis" ("Tilgung"). The latter is impossible at the present time of financial stringency and it is apt to lead the farmers to expect that the disease will be stamped out in a short time.

A thorough clinical examination of all animals should be made twice a year and samples of the mixed milk should be examined at the same intervals.

All animals should be marked on the ear so that a record of the results of past examinations can be kept and the tuberculin ophthalmic test should be introduced for use on all animals, or if the expense be considered too great, at least on all animals not in obvious good health. Isolation and removal of reactors, as in other tuberculosis control methods, is advocated. All healthy animals should be inoculated against the disease (Tuberkulosan-Burow or Friedmann's vaccine); tuberculous animals should be examined carefully and weighed, and their milk examined four times a year. Provision for the strict examination of animals added to the herd and of calves is also made in these suggestions.

The importance of diet in the prevention of disease is emphasized strongly and farmers should be instructed in the use of lime and other land dressings.

The vital factor for success is thoroughness.

J. T. E.

VEENSTRA, R. H. (1932). Over Verborgene Tuberculeuze Haarden bij Varkens. [Concealed Tuberculous Lesions in Pigs].—*Tijdschr. Diergeneesk.* 59. 310-316.

This paper, which issues from the abattoirs at Amsterdam, contains an account of the detection of tuberculous lesions in the "official" lymph-glands of the carcasses.

A. LESLIE SHEATHER.

CHRISTIANSEN, M. (1931). Ausgedehnte Organtuberkulose bei einem Reh, verursacht durch den Geflügeltuberkelbazillus. [Extensive Tuberculosis in a Deer caused by the Avian Tubercle Bacillus].—*Zeitschr. Infektkr.* 40. 165-171.

The author describes lesions found in the liver and spleen of a deer which were caused by bacilli of the avian type. The lesions ranged in size up to that of an egg and were fluctuating; the soft cheesy contents showed calcareous particles. The bacillus was identified by animal inoculation as being of avian origin and on inquiry it was found that the deer was in the habit of frequenting land used for poultry.

A. LESLIE SHEATHER.

DALLING, T. (1931). Avian Tuberculosis.—*Vet. Rec.* 11. 1202.

The author directs attention to the value of the tuberculin test for the eradication of avian tuberculosis from a flock.

He tested the efficacy of avian tuberculin on artificially infected fowls and found that, although it occasionally failed to detect an affected bird or caused a positive reaction in a normal bird, it was sufficiently reliable to be of practical value for combating the disease.

T. M. DOYLE.

VAN HEELSBERGEN, T. (1932). Vogeltuberculose bij den Mensch. [Avian Tuberculosis in Man].—*Tijdschr. Diergeneesk.* 59. 258-272.

After giving a brief account of the cultural and morphological characters and of the pathogenicity of the bacillus of avian tuberculosis, the author describes a lesion occurring in man which was attributable to infection with this organism.

While infection *per os* is probably a frequent means of access to the human body, there are undoubtedly cases in which the infection is contracted by other routes. A survey is given of the reports regarding the occurrence of lesions in the lungs, kidneys, skin and mucous membranes. Reference is also made to the possibility of Hodgkin's disease and leucæmia being caused by tubercle bacilli of the avian type.

A. LESLIE SHEATHER.

— (1931). L'anæso-tuberculina (A. E. T.) nella diagnosi della tubercolosi bovina. [Anæso-tuberculin (A. E. T.) in the Diagnosis of Bovine Tuberculosis].—*Clin. Vet. Milano.* 54. 967-971. [9 refs.]

An account is given of a small number of subcutaneous tests carried out with anæso-tuberculin prepared by FINZI in comparison with tests carried out with

ordinary tuberculin. Two kinds of tuberculin were received from FINZI for trial. One of these was prepared with a glycerin broth medium and the other with a synthetic medium.

Anæstotuberculin (A. E. T.) is said to contain thermolabile substances derived from the bacilli which are not present in ordinary tuberculin. It is claimed that A. E. T. gives more pronounced reactions.

A. LESLIE SHEATHER.

EKLUND, N. (1931). **The Sahlgren Agglutination Test : some Results in Cases of Pulmonary Tuberculosis.**—*Acta Med. Scand.* **75**. 277-295. 4 tables, 20 figs. [1 ref.]

Based on the theory that the increase of globulins in the plasma in various pathological conditions causes more active formation of rouleaux and consequent agglutination of red cells, it is considered that a dilution of the plasma and consequently also of the globulins, should cause a disappearance of rouleaux. The amount of dilution required for this purpose should be proportional to the concentration of globulins in the plasma. The Sahlgren agglutination test is carried out with whole blood, a 3.7 per cent. sodium citrate solution being the diluent, and the author has tested a large series of cases of pulmonary tuberculosis in parallel using this test and the suspension stability test. As the latter test cannot be read for an hour or so and the agglutination test can be carried out on slides, observed under the lower power of a microscope and read in a few minutes, the agglutination test is advocated for employment in general practice. Agreement was reached in the two tests in 143 out of 200 cases. The differences in the remaining 57 cases are considered by the author not to be so great as to make any practical difference.

R. LOVELL.

I. BLANC, G., & VALTIS, J. (1931). Sur la sensibilité du *Spermophile* de Macédoine (*Spermophilus citillus*) à l'infection tuberculeuse expérimentale. [**The Susceptibility of the Macedonian Spermophile (*Spermophilus citillus*) to Experimental Tuberculosis.**—*C. R. Acad. Sci.* **192**. 182-185. [1 ref.]

II. FELDMAN, William H. (1931). **Susceptibility of the Gopher (*Citellus tridecemlineatus*) to *Mycobacterium tuberculosis*.**—*Amer. J. Path.* **7**. 139-146. 4 text figs. [2 refs.]

I. METCHNIKOFF found that experimental tuberculosis infection of the spermophiles of the Russian steppes (*Spermophilus citillus*, *S. guttatus* and *S. fulvus*) resulted only in a local lesion at the site of inoculation; MACGOY and CHAPIN, however, have found the prairie squirrel of San Francisco to be readily susceptible to spontaneous tuberculosis. The authors therefore investigated the reaction of the Macedonian gopher (*S. citillus*).

Subcutaneous or intraperitoneal injection of a bovine strain resulted in a generalised infection which differed from that seen in guinea pigs in that the spleen was rarely and the liver nearly always affected; no reaction was obtained by an intradermal tuberculin test even when typical nodular lesions were found present on *post-mortem* examination.

II. The author has investigated the action of avian, human and bovine strains of *B. tuberculosis* on the striped gopher (*Citellus tridecemlineatus*). Well-

defined lesions of tuberculosis were obtained in each case when the bacilli were administered intravenously, and resulting cytological reactions appeared to be identical. The animals proved to be more resistant to the avian strain than to the bovine or human strains; the most extensive lesions resulted from inoculation with the human strain. No lesions resulted, however, from the one subcutaneous inoculation of an animal with human bacilli, and the author therefore doubts whether the gopher could be used as a substitute for the guinea pig in diagnostic work, as suggested by HEWETSON. Infection appears to depend too much upon the route of inoculation.

NORMAN HOLE.

I. VAUCEL, M., & BOISSEAU, R. (1931). Premiers essais de vaccination antituberculeuse par le BCG à Brazzaville. [**Tests of BCG Vaccine at Brazzaville**].—*Bull. Soc. Path. exot.* **24**. 173-175.

II. LOKHOFF, D. D., & LEVITAN, I. K. (1931). Altérations anatomo-pathologiques chez les lapins vaccinés avec le BCG. [**Histo-pathological Changes in Rabbits inoculated with BCG Vaccine**].—*Ann. Inst. Pasteur.* **47**. 45-56.

I. In view of the promised development of the French West African possessions, and the consequent increase in the white population, Vaucel and Boisseau have carried out a series of tuberculin tests on natives to determine the incidence of tuberculosis among them.

For various reasons it was not possible to start the use of BCG vaccine until 1930. During that year 257 school children were inoculated subcutaneously with 0.01 mg. doses. The inoculation was not followed by any constitutional disturbance.

II. This is a continuation of a previous publication by Lokhoff and Levitan [(1930). *Ann. Inst. Pasteur.* **45**. 740].

They describe the microscopical appearances of the lungs, liver and spleen of healthy rabbits inoculated either intravenously or intraperitoneally with varying doses (1.0 to 50.0 mg.) of BCG.

Another group of rabbits was first inoculated intravenously with varying doses of a human strain of tubercle bacillus and, later, given 1/160 mg. of BCG intravenously.

It was found that the progression of tuberculous lesions was slowed down under the influence of BCG as evidenced by a longer survival of the rabbits and less extensive lesions than in controls.

The authors conclude that the inoculation of tuberculous animals with BCG has undoubtedly an effect on the course of the disease, but to determine accurately the effect of the BCG it will be necessary to study a large number of animals under varying experimental conditions.

T. M. DOYLE.

BLUMENBERG, W. (1931). Untersuchungen zur Frage der Virulenzsteigerung des BCG. [**Experiments regarding the Exaltation of Virulence of BCG**].—*Zlb. Bakt. I. (Orig.)*. **122**. 186-192.

This paper was read at a meeting of the German Society for Microbiology held at Heidelberg. The author describes experiments which he has carried out during the last five years with the object of determining whether the attenuated virulence is a fixed character or whether, by suitable means, it is possible to exalt

it. Two sets of experiments were carried out to test the pathogenicity of BCG for guinea pigs, one with a Behringwerke strain and another with strain BCG 341. The latter strain was found to be the less virulent of the two, but it conferred a lower degree of resistance to experimental infection.

Strain 341 was tested by direct and indirect animal passage. In the direct passage tests, guinea pigs were inoculated directly with material from lesions in other inoculated animals. In the indirect series cultures were made between each set of inoculations.

In the direct series no evidence of any exaltation of virulence was obtained. It was, in fact, found to be impossible to carry on the inoculations beyond the fourth direct passage.

In the indirect series, however, some evidence was obtained that a certain degree of exaltation of virulence had occurred. This was indicated by the nature and the extent of the lesions produced in the lymphatic glands.

The exaltation was not, however, steadily progressive through the series. After eight passages no further exaltation of virulence appeared to take place.

A. LESLIE SHEATHER.

WALTON, S. T. (1932). **Complement Binding Properties of *Brucella abortus* of Bovine and Porcine Origin.**—*J. Immunol.* **22**. 19-40. 5 tables, 7 figs. [34 refs.]

Nineteen strains of *Brucella abortus*, ten of porcine origin and nine of bovine origin, have been studied by complement fixation and absorption of agglutinin tests. The author found no appreciable difference in the two types of organisms when tested by these methods. [It is more and more apparent that one should not attempt to rely on one or even two tests for differentiation of the types of brucellae.]

R. LOVELL.

MARSHALL, M. S., & JARED, D. (1931). **Microbic Dissociation in the *Brucella* Group.**—*J. Infect. Dis.* **49**. 318-336. 1 plate with 8 figs., 3 tables. [20 refs.]

Strains of brucellae isolated from various sources and various countries were subjected to growth on liver hormone agar to which 1 per cent. of antiserum had been added. After several subcultures, when the organisms had been grown on such a medium for from one and a half to three and a half months, rough colonies (R) as opposed to the normal smooth colonies (S) were apparent. The characteristics of the R colonies were their opacity, granularity, occasionally irregular edges, and larger size as compared with those of the S forms. In broth, R cultures were flocculent or granular. There was also a loss of agglutinability of R suspensions by brucella antiserum. There appeared to be little difference in the resistance of S and R cultures to various dyes, although a slight increase in resistance by R cultures is claimed. No correlation was noted in the production of sulphuretted hydrogen. The experiments as to the utilization of dextrose were not clear and a further study along these lines is advocated. Guinea pigs were regularly infected with S cultures, with various pathological changes, recovery of the organism, and production of agglutinins in the blood. Corresponding R cultures produced few signs of infection. Similar results were obtained in a few rabbits inoculated into the crystalline lens of the eye. The authors stress the need for study of variation in the brucella group, and consider it to be more

logical than a study based on a conception of relative stability of strains according to their animal origin.

R. LOVELL.

VAN DER HOEDEN, J. (1932). Over den Groei van *Brucella Bang* in Afgesloten Ruimte. [The Cultivation of *Brucella Bang* in Closed Tubes].—*Tijdschr. Diergeneesk.* 59. 250-257.

The author has carried out a series of cultural experiments with strains of *Br. abortus*, isolated in Holland, with special reference to their atmospheric requirements. Seventy-one strains were used and of these only one, which was recovered from a dog, grew in ordinary atmospheric air. All the other strains required a higher percentage of carbon dioxide. Twenty-eight of the strains used were isolated from horses and three from men.

Growth of the organism causes a rise in the percentage of carbon dioxide present.

A. LESLIE SHEATHER.

SCHUMANN. (1931). Die Impfung in Abortusherden mit lebenden Kulturen und die angebliche Gefahr der Übertragung der Bang-Infektion auf den Menschen. [Vaccination with Living Culture in Aborting Herds and the alleged Danger of Transmission of Bang Infection to Man].—*Deuts. tierärztl. Wschr.* 39. 567-569.

The data were obtained in the course of the control of abortion and sterility in 473 large herds in Lower Silesia. Abortion had occurred in 244 herds. In 55 of these, no further case occurred after one vaccination with living culture; in 65 herds only isolated cases occurred.

The average number of abortions in these herds before vaccination was 22 per cent. Attention is drawn to the fact that they were being examined every six months; infection was therefore detected at an early stage.

In ten herds which were not vaccinated but kept under observation for a period of three years, the average annual abortions were 19 per cent. In 50 herds containing 3,242 animals in which vaccination with living culture was carried out irregularly—certain animals being missed and some pregnant animals vaccinated—439 cases of abortion occurred during the period of 3 years, i.e. 4.5 per cent. in each year. In 106 herds with 6,223 animals which were regularly vaccinated, the annual abortions were 2.2 per cent. No abortions occurred in 48 of these 106 herds after the first vaccination.

Of 84 animals which had aborted, 45 per cent. were found to excrete brucella with the milk; amongst serologically positive but otherwise healthy animals the percentage was 52.

Brucella were found in 22 per cent. of the samples taken in the course of the tuberculosis eradication campaign. In Breslau they were also found in 51 per cent. of samples of raw milk and in 28 per cent. of those sold as pasteurized.

An approximately equal percentage of infected mixed samples—about 58 per cent.—were obtained from vaccinated and unvaccinated herds in which abortion was occurring, and from vaccinated herds in which there were no abortions. From unvaccinated herds in which no abortion had occurred for six months, only 24 per cent. of positive samples were obtained.

The author does not believe that a large proportion of cases in man can be due to milk. His conclusion is that vaccination with living culture causes no

increased danger to man, and that, if carried out regularly on non-pregnant animals in conjunction with hygienic measures, it can bring about a decrease of abortions from 22 per cent. to 2·2 per cent.

A. W. STABLEFORTH.

VAN DER HOEDEN, J. (1931). Verdere Onderzoekingen over *Brucella*-infecties bij paarden. (Mededeelingen van de *Brucella* Bang-Commissie). [Further Investigations regarding *Brucella* Infections in Horses. (Publication of the *Brucella* Bang Committee)].—*Tijdschr. Diergeneesk.* **58**. 1321-1330.

The author gives an account of his serological investigations of cases of suppurative in equines, using *Brucella abortus* cultures as antigen.

Of 15 horses suffering from "poll-evil," 14 gave positive agglutination and complement fixation reactions. Two out of six showing abscesses of the sternum reacted in a similar manner, while 33 cases of fistulous withers all gave positive serum reactions.

Cultural investigations were carried out in 44 cases and the bacillus was recovered in 28 of them. In those cases in which unopened abscesses were available for examination, only *Br. abortus* was obtained.

The strains were of the bovine type, but in many of the cases it was impossible to trace any connection with bovine abortion.

A. LESLIE SHEATHER.

JAMES, W., & GRAHAM, R. (1931). The Effect of Metaphen on the Agglutinin Titre of Cows suffering from Bang's Disease.—*J. Amer. Vet. Med. Ass.* **79**. 554-556. 1 table.

This paper reports the results of a few experiments on cattle infected with *Br. abortus* and records the fact that the animals show no change in agglutinin titre after treatment with metaphen, even in large quantities. No ill-effects resulted from the treatment.

W. R. WOOLDRIDGE.

COTTON, W. E., & BUCK, J. M. (1931). Bureau of Animal Industry Researches on Infectious Abortion.—*J. Amer. Vet. Med. Ass.* **78**. 306-325.

The authors review the investigations carried out on contagious abortion during the past nine years at the Bureau of Animal Industry Experiment Station, Bethesda, Maryland.

It was shown that porcine strains of *Br. abortus* were more virulent than bovine strains for guinea pigs and that the lesions produced by the two strains were different.

The strains were also different in their behaviour towards bovines and pigs; the porcine strain failed to infect bovines by natural means and *vice versa*, although infection could be induced by intravenous inoculation.

While it is generally believed that the digestive tract is the principal channel through which infection occurs, Cotton and Buck proved that pregnant animals are very susceptible to infection through the conjunctiva. It was found also that infection could be set up through the unbroken skin.

On several occasions during recent years, porcine strains of *Br. abortus* have been isolated from cattle and, in view of the known pathogenicity of these strains for man, more information as to the origin of these infections is essential.

Some years ago the authors examined a number of commercial vaccines and found one which contained a porcine strain; they consider it possible that there may be other vaccines of the same type on the market.

Prior to the discovery of the pathogenicity of *Br. abortus* for man, attempts were made to immunize cows with porcine strains, but on account of the low degree of protection conferred and the fact that the organisms became localized in the udder the method was discontinued.

It was established that low agglutination titres (1 : 100 or less) rarely indicate infection whereas titres of 1 : 200 or higher signify infection in more than 80 per cent. of cases.

It was found to be economically possible to control the disease in some herds and to eradicate it in others by systematic testing combined with the isolation or disposal of reactors.

In herds where the disease was particularly active or where adequate control measures could not be thoroughly carried out, testing coupled with the incomplete measures adopted did not give uniformly good results.

Vaccination with avirulent strains of *Br. abortus* has not been an unqualified success, but further investigations into the method are in progress. It appeared to confer considerable resistance to infection in pregnant animals, but was useless when administered before conception. Encouraging results were obtained with moderately virulent vaccines. A marked degree of protection was conferred on heifers by vaccination prior to conception; their agglutination titres, although showing a temporary rise, soon became markedly reduced and in some instances entirely disappeared.

As the result of vaccination, *Br. abortus* sometimes became localized in the udder; this is a serious objection to the method on account of the potential danger to man from infected milk.

T. M. DOYLE.

MARTIN, J. W., & MYERS, J. T. (1931). **Brucella Antibodies in Human Serum.**—*J. Prevent. Med.* **5**. 243-248. 2 tables. [10 refs.]

The authors record the results of parallel macroscopic agglutination and complement-fixation tests for brucella antibodies on sera from 200 meat-packing employees and on 1,000 routine Wassermann sera. From the sick-list of a meat-packing establishment covering the previous 18 months, 100 persons were selected whose illnesses suggested undulant fever, the remaining 100 were from various departments and served as controls. Brucella antibodies were found in the serum of 15 of the 100 selected from the sick-list and in 3 of the control group. The agglutination titres varied from 1 : 80 to 1 : 1,280. Brucella antibodies were found in 43 of the 1,000 Wassermann sera, agglutination titres varying from 1 : 20 to 1 : 640. Complement-fixation, macroscopic agglutination and HUDDLESON'S rapid macroscopic agglutination tests were parallel in their results and appear to be equally accurate for laboratory diagnosis. No one department of the meat-packing plant showed a definitely higher proportion of positive sera than another, although it is admitted that a more complete survey might reveal differences.

R. LOVELL.

BIGGER, J. W. (1931). *Br. abortus* in Relation to Man in Ireland.—*Irish J. Med. Sci.* **64**. 150-154.

Epizootic abortion is a common disease of dairy cows in Ireland but, although the greater part of the milk is consumed in a raw state, undulant fever is of rare occurrence. The most probable explanation for the rarity of undulant fever would appear to be the low virulence of the bovine strains of *Br. abortus* for man.

500 sera submitted for Wassermann test were tested for the presence of *Br. abortus* agglutinins; 20 per cent. of the sera had a titre of 1:20 or higher, 4.4 per cent. 1:50 or higher and 2 per cent. 1:125 or higher. No serum had a titre of 1:250. The sera showing agglutinins were provided by approximately equal numbers of males and females.

A. D. McEWEN.

LAHAYE, J. (1931). La diarrhée blanche bacillaire des poussins. [**"Bacillary White Diarrhoea" of Chickens**].—*Ann. Méd. vét.* **76**, 497-519.

The author discusses the relative values of the tube agglutination test and the "pullorin" test (cutaneous inoculation of extracts of *B. pullorum* into the wattles) for the detection of "carriers" of *B. pullorum* and states that in his experience the "pullorin" test is the more accurate.

He claims that fowls which were subjected to three successive agglutination tests within a year gave positive, negative and positive reactions, respectively.

[The "pullorin" test has been extensively tried both in England and in America, and workers are generally agreed that it is so unreliable as to be of little practical value. The tube agglutination test while admittedly a laborious method has proved to be a test of great accuracy in competent hands. The inaccuracies attributed to it by Lahaye are now generally recognised to be caused by errors of technique.]

T. M. DOYLE.

ULLRICH, K. (1931). Ueber das Vorkommen der bakteriellen weissen Kückenruhr in der C. S. R. [**The Occurrence of "Bacillary White Diarrhoea" in Czechoslovakia**].—*Prag. Arch. f. Tiermed.* **11**, 171-184.

The author states that, judging from the literature, "bacillary white diarrhoea" does not occur in Czechoslovakia. This, however, is not a correct assumption as he himself has been able to detect the presence of the disease.

It is unfortunate that the author says there are two forms of bacillary white diarrhoea—one caused by *B. pullorum* and the other by coccidia—as this tends to create confusion. The article is a survey of the subject for the benefit of practitioners in Czechoslovakia.

A. LESLIE SHEATHER.

WILLEMS, R. (1931). La Broncho-pneumonie contagieuse des bovidés forme pectorale de la Pasteurellose. [**Contagious Broncho-pneumonia of Bovines, or the Pectoral Form of Pasteurellosis**].—*Ann. Méd. vét.* **76**, 449-464.

The author divides bovine pasteurellosis into three forms:—(1) the septicæmic form; (2) the œdematous form, characterised by œdema of the head and neck, and (3) the pectoral form characterised by broncho-pneumonia and pleurisy.

He states that all three forms occur in Belgium, but not with the same frequency. In the septicæmic form which is seen from time to time, there are neither symptoms nor pathognomonic lesions and cases are invariably fatal. The œdematous form is rare.

The pectoral form is frequently observed and has assumed a marked virulence since 1926: about that time considerable attention was paid to it on account of the resemblance shown by the lung lesions to those of contagious bovine pleuro-pneumonia. Investigation proved, however, that the disease was pasteurellosis.

Willems says that he terms the disease "contagious broncho-pneumonia of bovines" because this designation is descriptive of the lesions present in the majority of the affected animals, and that he has no intention of separating the condition from the pasteurella group to which it legitimately belongs.

Contagious broncho-pneumonia occurs sometimes on farms where the most searching inquiry fails to reveal any possible channel through which the infection might have been introduced. These cases must be regarded as examples of spontaneous infection. On the other hand, infection from outside sources is frequently the cause of outbreaks of the disease and generally follows the introduction of an affected bovine.

An animal which has been on a long journey, or has been subjected to any fatiguing or debilitating conditions, may fall a victim to the disease and, according to Willems, may be the means of introducing it to a farm.

The causal organism is frequently a saprophyte and may be present in the respiratory or intestinal tracts of normal animals.

The author gives a description of the tinctorial and cultural characteristics of the organisms of the pasteurella group. These bipolar organisms are widely distributed in nature: occasionally some unknown factor exalts their virulence and they give rise to cases of "spontaneous infection" in cattle. As a rule, strains of the organism show a marked preference for the species of animal first attacked. In one instance, all the pigs on a farm were affected while the cattle remained healthy, although porcine and bovine strains are closely allied. More peculiar still are the strains which attack calves, but leave adult cattle unaffected. Sometimes, however, a strain adapted to one species attacks another, as for example a bovine strain affecting pigs.

The author describes in detail the clinical symptoms and *post-mortem* lesions observed in affected cattle. On autopsy the thoracic cavity contains a yellow or reddish serous fluid or a sero-fibrinous exudate; the pleura is inflamed and spotted with petechiae.

Various stages of hepatization are present in one or both lungs and, in conjunction with an œdematous thickening of the interlobular tissue, give a marble-like appearance to the organ very similar to that seen in bovine contagious pleuro-pneumonia.

In order to demonstrate the presence of the bipolar organisms, Willems recommends the intraperitoneal inoculation of guinea pigs with serous fluid from the lungs. The inoculated guinea pigs develop a characteristic peritonitis subsequent to which the bipolar organisms can readily be obtained in pure culture.

Specific immune serum in large doses (100 c.c.) may be tried for the treatment of affected animals, but it gives inconstant results; it should, however, be used for incontact animals.

The subcutaneous injection of electrargol and the intravenous injection of novarsenobenzol have been favourably reported on as curative agents.

T. M. DOYLE.

- I. SANARELLI, G., & ALESSANDRINI, A. (1931). L'ultravirus typhique. [**Typhoid Filtrable Virus**].—*C. R. Soc. Biol. Paris*. **108**. 405-408. [5 refs.]
- II. SANARELLI, G., & ALESSANDRINI, A. (1931). L'ultravirus paratyphique. [**Paratyphoid Filtrable Virus**].—*Ibid.* 460-463. [1 ref.]

By the use of collodion sacs the authors claim to have succeeded in filtering viruses from *Bact. typhosum* and *Bact. paratyphosum* B. The virus in each case is considered to be a phase in the development of the bacteria, and is not readily cultivable, although after several passages the granular forms present acquire the antigenic qualities of the original culture as tested by agglutinating sera. The filtration experiments were carried out in broth, in agar and in the peritoneal cavity of the rabbit. In the case of *Bact. paratyphosum* B, the insertion of a collodion sac containing a virulent suspension in the peritoneal cavity of a rabbit produced a long illness from which the animal recovered. During the illness, agglutinins for the bacteria were discernible in the blood serum of the rabbit. In certain cases, however, a serious illness with a septicaemia was produced. [No details of the experiments are given and, before such phenomena can be accepted, extended experiments with essential careful controls are necessary.]

R. LOVELL.

ASBELEW, W. N., & MOSTOWA, R. S. Ueber die serologischen Eigenschaften des *Bacillus faecalis alcaligenes*. [**The Serological Characters of the *Bacillus faecalis alcaligenes***].—*Zlb. Bakt. I. (Orig.)*. **122**. 337-346. 4 tables. [7 refs.]

Bacillus faecalis alcaligenes yields agglutination tests with typhoid and paratyphoid sera which run closely parallel with the Widal tests of the same sera.

Since strains of the organism recovered from the blood of human beings apparently become agglutinated by normal sera in a considerable number of cases, it must be considered whether the test is to be regarded as a means of recognising the bacillus as a cause of disease.

Tests with monovalent antisera from rabbits indicated that practically all the strains isolated from human beings belong to one group. Strains of organisms isolated from sewage and identified as *B. faecalis alcaligenes* were not agglutinated by antisera for the human strain, and it would appear that the recognition of the organism (morphologically and biologically) as an indication of faecal contamination of water is a point requiring thorough investigation.

A. LESLIE SHEATHER.

DISEASES CAUSED BY PROTOZOAN PARASITES.

KITOAKA, Masami. (1931). Ueber ein neues Phänomen bei Wasserleptospirakultur. Eine Methode zur Reinkultur der Wasserleptospiren mittels dieses Phänomens. [**A New Phenomenon in Water Leptospira Culture. A New Method of Pure Cultivation by means of this Phenomenon**].—*Zlb. Bakt. I. (Orig.)*. **122**. 314-318.

The author has devised a special form of culture tube for the isolation of leptospira from water.

The main tube is 17 cm. × 17 mm. A smaller tube 90 × 6 mm. is welded to the outside of the main one at a point 2 cm. from the bottom so that their

lumina communicate and so that the angle between the two tubes is 25° . Ringer agar containing rather less than 0.8 per cent. agar and 5 per cent. rabbit serum is put into the tubes so that the medium comes about 1.5 cm. above their junction.

HINDLE'S method of enrichment may first be carried out and then the medium is inoculated, but pure cultures may be obtained from contaminated materials by means of the special tube as gross particles of the inoculum float at the top of the wide tube and it is at this point that the leptospiral growth occurs.

The leptospira grow in the form of a disc below the surface of the medium in the side tube where they are not contaminated by this material.

Experiments indicate that pathogenic leptospira are more difficult to cultivate than the water leptospira.

A. LESLIE SHEATHER.

DISEASES CAUSED BY FILTRABLE VIRUSES.

HENRY, M., SEDDON, H. R., & BLUMER, C. (1931). **The Swine Fever Outbreak of 1927-1928 in New South Wales.**—*Spec. Rep. Dept. Agric. New South Wales.* 138 pp.

This report deals with a series of outbreaks of swine fever in New South Wales which appear to have originated with a consignment of affected pigs from Victoria.

The report is divided into three sections: in part I, Henry describes the history of the epizootic and the administrative action taken to control it; in part II, Blumer gives details of the outbreaks which occurred and, in part III, Seddon describes the pathology of swine fever, differential diagnosis and experiments carried out on the viability of the virus.

Henry points out that there is little doubt that, prior to 1927, Victoria had been for many years free from swine fever and, as in the outbreaks under discussion Melbourne was the centre of infection, he considers it probable that the disease was introduced through garbage obtained from overseas ships. The Federal Government have now issued regulations prohibiting the introduction of ships' garbage into Australia.

The disease was controlled by the slaughter of affected and in-contact pigs as this was considered the most economical policy and the best method of preventing the dissemination of infection throughout the State.

In New South Wales, 99 outbreaks occurred in which 2,263 pigs died and 13,418 were destroyed as infected or in-contact. Within the State, the disease appeared to have been disseminated to a considerable extent by the feeding of garbage containing infected pork.

In 1928, there was a recrudescence of the disease and, as there was strong circumstantial evidence that infection had arisen from pork which had been in cold storage, it was decided that in future no carcasses from infected premises should be used for consumption.

Apart from the initial outbreak in New South Wales, the probable origin of which has already been referred to, all secondary infections appear to have arisen through the feeding of offal.

Henry discusses the importance of the infected carcass as a means of introducing the disease. The theory occasionally put forward that there has been for some time latent swine fever infection in Australia and that the 1927-28 epizootic resulted from an exaltation of the virulence of the virus does not merit serious consideration as it is highly improbable that the disease could exist

undetected for any length of time amongst a very susceptible pig population. There is strong circumstantial evidence that on each occasion that swine fever has appeared in Australia it has been introduced through infected pork or bacon or in garbage from ships.

In part II, Blumer gives full details of the various outbreaks together with maps of the infected areas.

In part III, Seddon gives an excellent description of the lesions of acute swine fever as it occurs in highly susceptible pigs and discusses its differentiation from necrotic enteritis (*B. suispestifer* infection) and contagious pneumonia of pigs.

He points out that susceptibility to swine fever is greater in young than in adult pigs, but he does not agree with the view so frequently advanced that it is essentially a disease of young pigs. [The opinion of some observers that swine fever is essentially a disease of young pigs has arisen through their failure to distinguish between necrotic enteritis (*B. suispestifer* infection) which is essentially a disease of immature pigs and swine fever which affects pigs of all ages].

On the question of differential diagnosis, Seddon states :

"In necrotic enteritis we have seen ulcers quite indistinguishable from those of swine fever and in cases of swine fever a diffuse diphtheresis that has a cheesy yellow appearance (apparently necrotic) but quite indistinguishable from lesions of necrotic enteritis. And it would be surprising if this were not so for present opinion seems to be to the effect that the necrotic lesions of both swine fever and necrotic enteritis are associated with the same bacterial flora, the only difference being that in one case the virus is present, in the other it is not."

On the question of diagnosis, Seddon expresses the opinion that it is impossible to diagnose the disease with certainty from a single lesion in a single organ unless perhaps it is by the congestion of the stomach or œdema of the walls of the caecum. It is essential that the whole *post-mortem* picture should be taken into consideration before making a diagnosis.

In experiments on the viability of the virus, it was shown that it could persist for 71 days in a carcass hung in a dark, cool (47° to 68° F.) room. The virus did not appear to survive either wet pickling or dry salting for 28 days. It was proved that starlings could carry the virus, probably on their feet, for a short distance.

[Seddon's report on the pathology and experimental investigation of various phases of the disease contains much valuable data and should be consulted in the original by those interested in the subject.

The rapid manner in which this series of suddenly appearing, widespread outbreaks of disease amongst highly susceptible pigs was controlled and eventually eradicated is ample testimony to the efficiency of the New South Wales Veterinary Department and to the energy and thoroughness with which a dangerous situation was dealt with by all concerned. With less efficient or slower handling, these serious outbreaks might have developed into a disaster for the Australian pig industry by allowing swine fever to secure a permanent foothold in the country.

It is noted with interest that no attempt was made to control infection by the use of immune serum as it was considered that a "stamping-out" policy was, in the circumstances, the most economical one to follow.

When this policy is adopted for the eradication of either swine fever or cattle plague in a recently infected country, the establishment of so-called "immune belts" around the infected centre is of doubtful value and may actually be dangerous through the suppression of clinical symptoms in affected animals.]

JANKAUSKAS, St. (1932). Die Schweinepest und ihre Bekämpfung in Litauen. [Swine Fever and its Control in Lithuania].—*Deuts. tierärztl. Wschr.* 40, 1-3.

Swine fever was first diagnosed in Lithuania in 1929, during which year 597 pigs were found to be infected on 119 farms. The disease had doubled itself in 1930 as 689 pigs on 130 farms were found affected during the first six months. The author believes that swine fever actually occurred before 1929 in Lithuania, but in a subacute or chronic form which was erroneously diagnosed as swine plague or erysipelas.

The pig industry of Europe reached very large dimensions in 1929 and the increase in swine population, together with greatly increased swine trade traffic, resulted in the dissemination of the disease; it is thought that virulent swine fever virus was introduced into Lithuania from outside and gave rise to its great increase in that country.

As evidence in support of this view, the author refers to experiments in which a German strain of the virus killed pigs in 10 days, whilst, with a Lithuanian strain, the period of illness in fatal cases was twice or three times as long and some pigs survived the infection. [This result could presumably be explained in other ways.] The author says that, owing to these facts, the native Lithuanian swine fever is quite different epizootologically and clinically from the ordinary acute swine fever of other countries and that its diagnosis is very difficult. [The evidence for such a sweeping statement appears to be meagre.] He discusses the details on this point.

Various methods of combating swine fever have been tried in Lithuania. According to the present method the disease is notifiable and there is State veterinary inspection of affected animals. All cases diagnosed as swine fever are slaughtered and compensation is paid up to 75 per cent. of the market value. In-contact swine with a temperature above 40·5° C. are also killed.

During the first one and a half years of operation of state swine fever control, 1,300 pigs have been slaughtered and 100,000 litas [one litai = 4·9d. at par] paid to owners. All in-contact swine judged as non-infected are inoculated with antiserum and virus the latter obtained from swine fever cases on the affected farm. The dosages used in simultaneous active immunization are 20 to 80 c.c. of antiserum with 1 c.c. of virulent defibrinated blood. Suckling pigs are given antiserum alone. Losses from simultaneous inoculation do not exceed 3 per cent. The author emphasises the value of a local virus for immunization purposes.

Swine herds are kept in quarantine until at least 6 weeks after immunization and the premises are disinfected under official supervision.

Progress in the instruction of farmers in the recognition and danger of swine fever is being achieved. The compensation system has much practical importance in that it stimulates farmers to notify cases of the disease. The penalties for failing to notify infection are severe (fine up to 1,000 litas and up to 3 months' imprisonment).

The author believes that the control of swine fever in Lithuania is progressing favourably by these means.

J. T. E.

LÜTTSCHWAGER. (1931). Zur histologischen Diagnose der Virusschweinepest. [On the Histological Diagnosis of Virus Swine Fever].—*Arch. wiss. prakt. Tierhkl.* 64, 236-244. [5 refs.]

Hæmorrhages which are characteristic occur in the kidneys of pigs affected

with swine fever. They may be observed histologically in kidneys which do not show macroscopic lesions. Therefore, the histological examination of the kidneys can be utilised in the diagnosis of swine fever.

J. R. M. INNES.

RÖHRER, H. (1931). Histologische Untersuchungen bei Schweinepest. III. Mitteilung. Veränderungen der Milz in akuten Fällen unter besonderer Berücksichtigung der Milzinfarkte. [**Histological Investigations in Swine Fever. Communication III. Changes in the Spleen in Acute Cases with special reference to Infarcts of the Spleen**].—*Arch. wiss. prakt. Tierhkl.* 64. 125-143. 15 figs. [18 refs.]

Occasionally in swine fever, the spleen shows mixed and anæmic infarcts, and so far these changes have not been investigated.

The author examined the spleens of 80 pigs infected with swine fever virus. The material was prepared for histological examination by the usual routine procedure, special staining methods being employed to demonstrate fat, elastic tissue and fibrin; the oxidase test was also applied. The spleens from 6 healthy pigs were examined as controls.

Infarcts, appearing most frequently at the margin of the organ, occurred in 55 to 60 per cent. of the cases; less often they traversed the parenchyma. Both anæmic and mixed infarcts occurred and these corresponded to the areas of the blood supply of the follicle arteries which showed pronounced changes. The lesions in the arteries consisted of hyaline swellings of the vessel wall; various stages occurred up to great hyalinisation and thickening with resultant obliteration of the artery lumen. Coagulative necrosis of the pulp followed as a consequence. A hæmorrhagic marginal zone of the infarcts was always present, and the extension of the zone depended on the rapidity with which the supplying arteries were obliterated. In most cases a small supply of blood through a greatly reduced lumen was possible. The alterations in the parenchyma of infarct-free organs and of those with infarcts were of small degree. There was a slight increase in the number of pulp cells, more or less marked perifollicular hyperæmia and, rarely, degeneration of the cells in the lymphatic follicles and in the pulp. These degenerative areas were mostly connected with fat deposition. Secondary infections particularly by bipolar organisms had an intensifying influence on the individual changes in the spleen, but were not of much importance.

J. R. M. INNES.

CZARKOWSKA-GLADNEY, J., & HURST, E. Weston. (1931). **Some Data concerning the Infectivity, Survival and Powers of Diffusion of the Virus of "Louping-ill."**—*Brit. J. Exp. Path.* 12. 426-430. 7 tables. [5 refs.]

Work carried out with the virus described by POOL, BROWNEE and WILSON [see this *Bulletin*. 1. 57.].

The authors' work on the cultivation of the virus of poliomyelitis had been "largely frustrated by the necessity of testing all potentially potent materials on monkeys, and it was hoped that similar work with the virus of louping-ill might afford indications for the successful culture of poliomyelitis virus and of neurotropic viruses in general. The present communication deals solely with preliminary investigations of the time of survival of the virus under such test conditions as might possibly be used in cultivation or in storage of cultures, of the possibilities of diffusion of the organism from infected brain into fluid media, and of the limits of infectivity on progressive dilution of the usual infective filtrate. The mouse has been used exclusively as the experimental animal."

In progressive dilutions of a 1 per cent. English-Berkefeld filtrate, infection may still be obtained in mice by the intracerebral inoculation of 0.05 c.c. of a dilution of 1:1,000,000 and sometimes of 1:10,000,000. In respect of the very minute amounts needed to produce the disease, the virus may be compared with the virus of foot and mouth disease. "It is effective in lower dilutions than the majority of neurotropic viruses and the very high potency of a Berkefeld filtrate argues, perhaps, for its small dimensions."

In tests of the survival of the virus in filtrates, the presence or absence of oxygen made little difference. The virus survived for as long as 14 days at 4° C., for 4 days at room temperature and for one day only at 37° C.

In sterile pieces of brain kept in Petri dishes, the virus remained unaltered for at least 60 days when kept frozen at -10° C.; in similar brain tissue kept in the cold room, definite loss of virulence had occurred after this interval. At room temperature, survival was for a few days only.

In 50 per cent. glycerol, at 4° C., infected mouse brain was virulent after 110 days.

In experiments with infected brain allowed to stand in a tube containing a fluid medium, under conditions permitting the survival of virus, there was clear evidence that the virus diffused into the liquid.

W. A. P.

- I. LÉPINE, P. (1931). Sur le virus écossais de la tremblante du Mouton (Louping-ill). Inoculation au Mouton. [**On the Scottish Virus of Sheep "Tremblante" ("Louping-ill"). Inoculation into the Sheep**].—*C. R. Soc. Biol. Paris*. 108. 397-399. 1 fig. [3 refs.]
- II. LÉPINE, P. (1931). Etude des propriétés du virus de la tremblante du Mouton. [**Study of the Properties of the Virus of "Louping-ill"**].—*Ibid.* 476-478. [4 refs.]
- III. LÉPINE, P. (1931). Etudes sur la tremblante du Mouton par inoculation à la Souris. [**Studies on "Louping-ill" by means of inoculation Experiments**].—*Ibid.* 665-667. [3 refs.]

Work with the virus isolated by POOL, BROWNLEE and WILSON [see this *Bulletin*. 1. 57.].

[The term "tremblante" is rather unfortunately used as it is generally understood to refer to the disease known in Scotland as "scrapie," a disease of unknown etiology which has no relationship whatever to "louping-ill," being absolutely different in its incidence in Scotland as to geographical distribution, type of farm and land topography, and in its clinical and pathological manifestations, age incidence and many other factors. "Louping-ill" is the term used for the disease under reference in the middle and eastern Border counties of Scotland and in parts of northern counties of England. In the Scottish western Border counties and in the western Highlands, it is called "trembling." There are, therefore, very strong reasons for the avoidance of the term "tremblante" because, on the continent of Europe, it is well known in connection with a different disease entity.]

I. The author has verified the susceptibility of the mouse to infection and has infected a sheep with virus passed through a series of eight mice. He describes the pathology and histology of the lesions of the brain and spinal cord of the sheep and shows a photo-micrograph of cerebral tissue.

II. In experiments carried out by means of intracerebral inoculations into mice, the author investigated certain properties of the virus.

The virus in the sheep brain originally received was still active after being kept in glycerol in cold storage 161 days. In similar conditions, mouse brain was infective in different experiments at intervals between 10 and 146 days. Frozen mouse brain was virulent after 11 days.

The virus was killed in 30 seconds at 80° C., in two minutes at 60° C. and in 10 minutes at 58° C. It was destroyed in 4 hours in a dilution of 1 : 250 of hydrogen peroxide and in 3 hours in 1 : 2,000 eau de Javal. After desiccation *in vacuo* over sulphuric acid the virus was inactive in 5 days. Filtration experiments yielded positive results with Berkefeld V and Chamberland L 3 candles, but a single test with a Seitz filter yielded negative results. Supernatant fluid of infective material was virulent after centrifugation at about 3,000 revolutions [no other details given] for 20 minutes.

The author has previously (1930) described electrophoresis experiments with certain viruses and, in similar experiments with the "louping-ill" virus, he found that at pH 7.3 the virus can be recovered from the positive pole.

He states that the virus is one of the most typical of the neurotropic group.

III. The author studied the symptomatology of the disease in inoculated mice. The first signs of infection are seen after 5 to 6 days when the mice show excitement and jump nervously at the slightest stimulus. They tremble, the gait becomes incoordinated and finally paralyses develop, usually in the hind limbs first. Death follows at the 7th to 10th day.

Lesions are only seen in the nervous system and these are described.

Infection of mice was constant when virus was introduced by intracerebral, intrasciatic and intra-ocular (posterior chamber) inoculation. Subcutaneous and intramuscular inoculation rarely infected and negative results were always obtained with intravenous and intraperitoneal inoculation and with instillation on to the intact mucous membranes of the mouth, nose, conjunctiva and vagina. In two experiments, scarification of the cornea yielded negative results.

The author could not infect mice by contact with infected mice so cannot corroborate the work on this point described by ALSTON and GIBSON [see this *Bulletin*. 1. 219.].

In the inoculated mice the virus was present after death in the brain and spinal cord, the peripheral nerves and the lymphatic glands. It was irregularly present (in ascending order of frequency) in the testicle, kidney, liver, spleen and once in the blood.

Virulent brain suspensions, diluted and centrifuged are still virulent at 1 : 500. Infection is inconstant with dilutions of 1 : 5,000, and a high proportion of the inoculated mice recover from an illness which develops after a prolonged incubation period. Mice are not infected with greater dilutions and unless they showed at least slight illness, they did not acquire any immunity from the inoculation.

Neither single nor repeated intraperitoneal inoculations with undiluted virus produced immunity to test inoculations given 15 days later. Immunization could only be produced by intracerebral or intrasciatic inoculation; immunized mice were resistant 3 months later. The serum of immunized mice was viricidal.

Rabbits and guinea pigs are insusceptible. Virus inoculated transcranially into rats did not cause any sign of disease, but it was present when tests were made 17 days later.

DU TOIT, P. J., & ALEXANDER, R. A. (1931). **An Attempt to Attenuate the "Virus" of Heartwater by Passage.**—*17th Rep. Direct. Vet. Ser. & Anim. Indust., Union of S. Africa.* Part I. pp. 151-160. 4 tables. Pretoria: Govt. Printer.

Two experiments are described in which attempts were made to attenuate the virus of heartwater by passage through sheep. In the first experiment, the virus did not appear to become attenuated in the course of 20 sub-inoculations.

In the second experiment, there appeared to be variations of virulence during the first 75 generations, but from the 76th to the 103rd generation a marked attenuation appeared to have been realised although, from the 87th generation onwards, some deaths occurred among the inoculated animals. During the last ten generations the majority of the experimental animals gave no reaction and there was a danger of losing the strain altogether.

The attenuation of the strain was not a fixed condition because, in a subsidiary experiment, blood containing virus of the 90th generation, when inoculated into 44 sheep, caused the majority of them to react and 11 died.

Sheep and cattle were inoculated with the attenuated strain and later their immunity to heartwater was tested by inoculations with virulent blood. Results showed that no appreciable degree of immunity had been conferred by the treatment with the avirulent strain.

A. D. McEWEN.

HERZBERG-KREMMER, Hedwig, & HERZBERG, K. (1931). Selbstentkeimung im Kaninchenhirn bei Vakzine-Meningo-encephalitis. [**Spontaneous Disappearance of Virus from the Brain of Rabbits in Vaccine-Meningo-Encephalitis**].—*Zlb. Bakt. I. (Orig.)*. **122**. 223-230. 5 tables, 2 figs. [5 refs.]

The observations and experiments recorded in this paper were carried out with a view to furnishing some information which would be of service in explaining the absence of virus from the brain in some cases of vaccine-encephalitis. It would appear to be a question of dosage.

It was found that, in fatal cases of vaccine-encephalitis induced in rabbits by intracerebral inoculation, the brain at the time of death may contain very little virus, or even no demonstrable quantity of it. The absence of any virus in the brain does not, therefore, warrant a negative diagnosis.

A further point investigated was the correlation between the amount of virus present in the brain and the co-incident histological changes. It did not appear that there was any constant relationship between these factors.

A. LESLIE SHEATHER.

NICOLAU, S., MATHIS, C., & CONSTANTINESCO, V. (1931). Sur un virus de l'Oulou-Fato (maladie du chien fou) isolé chez l'homme. [**On an "Oulou-Fato" Virus isolated from Man**].—*Bull. Soc. Path. exot.* **24**. 931-939. [22 refs.]

The authors describe a disease of dogs in French West Africa which has been claimed to be peculiar to the country and to be distinct from rabies; it is known in the vernacular as "oulou-fato" (or mad dog disease).

Its chief characteristics are the predominance of paralytic symptoms, little tendency on the part of the affected animal to bite and the rapidity of its onset.

It is generally believed by the natives, and by some Europeans, that man is insusceptible to infection.

The authors isolated a strain of virus from a patient who was bitten by a stray dog on 21st December and who died on the 21st January while undergoing anti-rabic treatment. As it was definitely stated that rabies did not exist in Matam (Senegal), the district in which the patient was bitten, they concluded he had died of "oulou-fato."

The presence of Negri bodies and cross-immunity tests proved the virus isolated to be a rabies virus, but one of unusually low pathogenicity.

In rabbits, the virus was confined to the brain and cord; in exceptional cases it was present in the brachial and sciatic nerves, but it was always absent from the salivary glands.

The Negri bodies present in rabbits showed certain peculiarities; they were not coloured red by Mann's method, but when other routine staining methods were used they were indistinguishable from those of classical rabies.

The authors point out that their observations on this African "street" virus confirm the contention of A. C. MARIE at the International Congress on Rabies in 1927 that there are many strains of "street" virus and that these can be differentiated from one another by certain characteristics, particularly by their differences in pathogenicity.

T. M. DOYLE.

ALBRECHT, A. (1931). Ueber die neueren Psittakoseerkrankungen bei Papageien und Menschen. [*The New Psittacosis in Parrots and Man*].—*Münch. tierärztl. Wschr.* **82**. 301-306.

This paper is a valuable summary of the literature dealing with psittacosis, but it contains no original matter.

It is rather emphasised that the causal agent of the disease, whether in parrots or in man, is not as yet definitely known and that diagnosis is in consequence a matter of considerable difficulty.

Up to 1929, there were 164 cases of the disease recorded in man. Between July, 1929, and the middle of January, 1930, 350 to 400 cases were recorded, with a mortality of 35 to 40 per cent. Since May, 1930, no further cases have been reported in Germany.

A. LESLIE SHEATHER.

I. DAVIS, G. E. (1931). **Complement Fixation in Yellow Fever in Monkey and in Man**.—*Amer. J. Hyg.* **13**. 79-128. 15 tables. [40 refs.]

II. THEILER, M. (1931). **Neutralisation Tests with Immune Yellow Fever Sera and a Strain of Yellow Fever Virus adapted to Mice**.—*Ann. Trop. Med. Parasitol.* **25**. 69-77. 4 tables. [1 ref.]

I. The author carried out a number of experiments primarily to determine the value of the complement fixation test in locating endemic areas of yellow fever, a purpose for which he found it to be of no value. Working on monkeys, however, he found that sera from recovered animals and from those which had been inoculated with active virus without reaction, invariably fixed the complement, whilst sera from normal monkeys and from monkeys inoculated with inactivated virus did not do so. Monkeys receiving active virus after inactive virus, or active virus with antiserum, were sometimes found to have sera possessing fixative properties.

In the greater part of his work the author used a serum-virus antigen drawn from monkeys during the febrile period of the disease. He found that the titre of the serum of a positive monkey could be revived by the injection of active or of inactive (55° C. for 15 minutes) serum-virus.

II. By testing them out against a virus of yellow fever adapted to white mice, the author has shown that human yellow fever sera possess definite neutralizing properties. The protection test carried out on the mice was very severe, but he found that definitely positive results were obtained under the optimum conditions of mixing equal parts of the sera with a 1:100 virus dilution and allowing the mixture to stand for 30 minutes at room temperature. The serum of a *rhesus* monkey that had not succumbed to experimental infection was especially marked in its neutralizing power.

NORMAN HOLE.

KAWAMURA, R., & IMAGAWA, Y. (1931). Die Feststellung des Erregers bei der Tsutsugamushi Krankheit. [**The Recognition of the Cause of Tsutsugamushi Disease**].—*Zlb. Bakt. I. (Orig.)* **122**. 253-261. 9 text figs. [7 refs.]

In this paper the authors describe the methods by which rickettsia can be demonstrated in the tissues in experimental and natural cases of tsutsugamushi disease. The organism very closely resembles *Rickettsia prowazeki*.

A. LESLIE SHEATHER.

GRATIA, A. (1931). Mise au point de quelques notions de bactériophagie. [**Adjustment of Ideas on Bacteriophage**].—*Bruxelles-Méd.* **11**. 697-703. 1 chart. [18 refs.]

D'HERELLE, F. (1931). Le phénomène de Twort et la bactériophagie. [**Twort's Phenomenon and Bacteriophage**].—*Ann. Inst. Pasteur.* **47**. 241-242. [3 refs.]

GRATIA, A. (1931). Le phénomène de Twort et la bactériophagie. [**Twort's Phenomenon and Bacteriophage**].—*Ibid.* 243-244. [3 refs.]

Gratia emphasises the specificity of bacteriophage and the fact that an acid reaction decreases and even inhibits its activity. He claims to have isolated from a staphylococcus culture a strain of bacteriophage which lyses almost all strains of staphylococci and states that it does not give rise to resistant secondary cultures. He has observed allergic reactions in carriers of staphylococci when they were inoculated with bacteriophage and suggests that these reactions aid the tissues in combating the infection. He recommends that cases of staphylococcal infection be treated with repeated inoculations of bacteriophage and "mycolysat" (cultures of staphylococcus lysed by a streptothrix). Referring to the original observations by D'HERELLE on anti-*B. dysenteriae* (Shiga) bacteriophage, Gratia points out that the phenomenon had been described two years previously by TWORT who observed it in a culture of micrococcus. He suggests that bacteriophage should be referred to as the Twort-D'Herelle phenomenon. He claims that by using an anti-staphylococcus bacteriophage he has succeeded in reproducing the appearances described by TWORT.

D'Herelle's communication is a protest against GRATIA's claim that by using anti-staphylococcus bacteriophage he has reproduced the appearance described by TWORT and that, therefore, bacteriophage should be known as the Twort-D'Herelle phenomenon. D'Herelle suggests that the appearances described

by GRATIA and illustrated by photographs in his communication are secondary cultures or artefacts. He challenges GRATIA to allow two independent bacteriologists to work with his cultures and suggests that the results should be published in order to settle the controversy.

Gratia replies to D'HERELLE's criticisms. He claims that he has repeated his observations and states that although he invited D'HERELLE to visit his laboratories the invitation was not accepted.

C. McG.

DISEASES CAUSED BY METAZOAN PARASITES.

SEDDON, H. R. (1931). **The Sheep Blow-fly Problem.**—*Pastoral Rev. Australia*. 41. 1194-1195. [An address broadcast by wireless on Nov. 17th, 1931.]

An account of the subject given in popular language. The sheep blow-fly is said to be a relatively new scourge in Australia; it has only caused serious trouble during the last 30 to 40 years. Seddon points out the varying extent to which different breeds of sheep are "struck" and the fact that some sheep are "struck" repeatedly, while others may escape altogether.

He and his staff have found that the progeny of sheep which are prone to be "struck" inherit this undesirable trait. The extent to which it can be eliminated by breeding is under investigation. There is some relationship between the fineness and condition of the wool and high susceptibility to the attacks of the flies.

Certain factors predispose the breech of Merino sheep to "strike." The essential point is a recognisable patch of wetness of the wool in this area wherein decomposition changes, probably associated with bacterial development, may proceed and so render it attractive to the fly. This is naturally associated with the wrinkling which is present in the breech in Merinos, but heavily wrinkled sheep may be free from the susceptibility to "strike."

"Strike" over the withers or along the back in these sheep is often associated with matting near the base of the staple by a gummy or pasty exudate which has an unpleasant odour and is often green, pink, blue, violet or yellow in colour, a condition due to bacterial growth. In good seasons this condition is not troublesome, but in a wet warm autumn when the fleece is wet for weeks the skin of the affected parts becomes waterlogged, the yolk of the wool is altered and the bacteria flourish. The condition is sometimes spoken of as "water rot" or "weather stain." The areas "struck" are usually those of a dirty yellow or grey colour. Again the susceptibility of individual sheep to "water rot" varies.

The author briefly discusses chemical agents used both for the treatment of the condition and as repellants, and also the general methods for its control.

W. A. P.

WHITEHEAD, W. E. (1931). **The Northern Fowl Mite.**—*J. Econ. Entomol.* 24. 917.

A brief note intimating that this mite, *Liponyssus sylviarum* C. and F., has lately been reported in the Province of Quebec, Canada, and that observations point to the fact that it has been there for some time. According to the Dominion entomologist [GIBSON, A.], there are only two previous Canadian records of the existence of the mite—from British Columbia and Ontario.

The mite has been found locally on the following wild birds :—starling (*Sternus vulgaris*), purple martin (*Progne subis*), kingbird (*Tyrannus tyrannus*), English sparrow (*Passer domesticus*), American robin (*Planesticus migratorius*) and catbird (*Galeoscoptes carolinensis*).

The mites have been found on fowls examined at the Macdonald College, Quebec.

W. A. P.

DIKOFF. (1931). Einiges über die Verbreitung auf den Menschen übertragbarer Parasiten bei den Haustieren in Bulgarien und deren Bekämpfung. [**The Dissemination in Bulgaria of the Parasites of Domestic Animals transmissible to Man and their Prevention**].—*Tierärztl. Rdsch.* **37**, 809-811. 2 tables, 1 graph.

Dikoff finds that the percentage of *Cysticercus cellulosae* in pigs slaughtered in Sofia from 1920 to 1929 varies between 0.39 and 2.45. There is no obvious reduction in its incidence as occurs in other civilised countries. *C. bovis* is much more common than is generally believed and as many as 5.8 per cent. of the calves slaughtered may be infected. *Trichinella spiralis* has been known in Bulgaria since 1884; during the past 20 years, 3.24 per cent. (1,065) of the pigs slaughtered have been infected, the highest percentage being reached in 1919. *T. echinococcus* is extremely common and probably 40 to 50 per cent. of all dogs carry the adult tapeworm—a percentage which rises to 60 or 70 in sheep dogs. He records various other tapeworms also from dogs, and finds that *Ancylostoma canis* [*sic*] is very common.

T. W. M. CAMERON.

PILLERS, A. W. N. (1931). **The Parasitic Origin of Poll Evil and Fistulous Withers**.—*Vet. Rec.* **11**, 1246-1247. 2 figs. [8 refs.]

The author quotes from veterinary literature to illustrate the fact that the presence of worms in cases of "poll-evil" and fistulous withers has been recognised for many years. He found pieces of *Onchocerca cervicalis* in a portion of diseased *ligamentum nuchae* from a horse in Lancashire, England.

J. T. E.

TAYLOR, E. L., & PURCHASE, H. S. (1931). **Do Penetrating Nematode Larvae assist Bacterial Invasion from the Bowel?**—*Parasitology.* **23**, 301-309. 4 tables. [19 refs.]

The activities of intestinal worms have frequently been blamed for the introduction of pathogenic bacteria into the animal body, but very little experimental work has been carried out to ascertain whether they actually do so. The authors here report experiments in which they administered embryonated eggs of *Ascaris lumbricoides* along with virulent cultures of *Bacillus anthracis* to guinea pigs, and with *B. suipestifer* to rabbits.

B. anthracis did not appear to be a suitable organism for these experiments and the negative results obtained are considered to be of no value. *B. suipestifer*, however, appeared to be suitable; some of the experimental rabbits died as a result of the test dose given by the mouth. The daily feeding of infective ascaris eggs before and after the administration of *B. suipestifer* did not, however, increase

the susceptibility of the rabbits, in spite of the fact that the number of ascaris larvae which reached the lungs were in some instances sufficient to cause death.

It is concluded that the wounds caused by burrowing nematode larvae and the numbers of pathogenic bacteria which they may carry into the tissues are of no significance in the invasion of the body by bacteria.

E. L. TAYLOR.

AFRICA, C. M. (1931). **Studies on the Host Relations of *Nippostrongylus muris*, with Special Reference to Age Resistance and Acquired Immunity.**—*J. Parasitol.* **18**. 1-13. 4 tables, 2 graphs. [7 refs.]

It was noticed that an experimental infestation of laboratory rats with this intestinal nematode is lost in the course of two to four weeks, whereas wild rats have been observed to retain it for some months. This paper is a report of a series of experiments on small numbers of laboratory rats undertaken to investigate the nature of the immunity.

The rats were infected by placing the larvae in a few drops of water on the skin of the abdomen, the hair having first been clipped, and by keeping them there for 20 to 45 minutes. Evidence of infestation was obtained by examination of the faeces for the presence of eggs.

It was observed that, after young rats have been exposed to infection with *N. muris*, the eggs appear in the faeces in 5 or 6 days, but completely disappear again in 11 to 19 days.

Experiments carried out on a small number of rats suggest that a strong acquired immunity results from a heavy infestation which, as a result, is speedily eliminated. Light infestations do not, however, result in the development of this immunity and the worms are retained for a longer period.

Age resistance was demonstrated by infecting four rats, two of eight months and two of two months, with 500 larvae each. All became infected, but whereas the young rats passed up to 19,600 eggs per gram of faeces, the older ones only passed up to 1,400 per gram and eliminated the infection earlier.

Post-mortem examination about the time when the infestation was leaving the rats showed that the males are longer lived than the females, which is contrary to what usually happens. The author was also able to confirm YOKOGAWA'S observation that infection through the skin is more effective than by the mouth.

E. L. TAYLOR.

- I. ACKERT, J. E., & PORTER, D. A. (1931). **Effects of Periodic Bleeding on the Resistance of Chickens to the Intestinal Nematode *Ascaridia lineata* (Schneider).**—*J. Parasitol.* **18**. 114.
- II. FOSTER, A. O., & CORT, W. W. (1931). **The Relation of Diet to the Susceptibility of Dogs to *Ancylostoma caninum*.**—*Ibid.* 117.
- III. FOSTER, A. O., & CORT, W. W. (1931). **The Effect of a Deficient Diet on the Susceptibility of Dogs and Cats to Non-specific Strains of Hookworms.**—*Ibid.* 117.

All three papers were presented at the 7th Annual Meeting of the American Society of Parasitologists, New Orleans, December 29th-31st, 1931.

I. In order to obtain some information on this point, two series of experiments were carried out involving the use of 300 chickens. Between 0.5 c.c. and 5.0 c.c. of blood were withdrawn from some of the birds at weekly intervals

and infection with *Ascaridia lineata* was experimentally produced at six weeks of age. Subsequent examination of the parasitic worms showed that those collected from chickens which had been subjected to repeated bleeding were significantly larger than those collected from the controls.

II. Observations carried out on nine dogs, which on account of previous infection and age were very resistant to the dog strain of *Ancylostoma caninum*, showed that dietary deficiency brought about a temporary breaking down of the resistance. A return to good feeding resulted in a speedy return to the resistant condition as shown by a reduction in the number of eggs passed in the faeces and by the elimination of the worms.

III. In this paper the authors report experiments which show that the natural resistance of dogs to the cat strain of *A. caninum*, and of cats to the dog strain, can, in a similar way, be broken down by keeping the animals on a deficient diet for considerable periods.

E. L. TAYLOR.

- I. SEDDON, H. R. (1931). **On the Manner of Transmission of *Moniezia expansa*, the Common Tapeworm of the Sheep.**—*Ann. Trop. Med. Parasitol.* **25**. 421-429. [3 refs.]
- II. SEDDON, H. R. (1931). **The Development in Sheep of Immunity to *Moniezia expansa*.**—*Ibid.* 431-435. 1 table. [3 refs.]
- III. SEDDON, H. R. (1931). **On the Life of *Moniezia expansa* within the Sheep.**—*Ibid.* 437-442. 3 tables. [2 refs.]
- IV. SCOTT, J. W., & HORNESS, R. H. (1931). **A Study of the Eggs of *Moniezia expansa*.** [Paper presented at 7th Ann. Meeting, Amer. Soc. Parasitologists, New Orleans, December 29th, 30th and 31st]. *J. Parasitol.* **18**. 130.

I. The first group of these series of observations was made in 1930 while the author was carrying out another experiment [SEDDON and McGRATH. (1931). *Rep. Dept. Agric. New South Wales*. No. 6. pp. 40-57.] in which two uninfected lambs were placed in each of six pens as follows:—

Pen A. Low-lying grass land with a permanent pool of water.

Pen B. Sloping grass land without any area on which surface water might lie.

Pen C. Like B.

Pen D. Part low-lying like A, remainder sloping like B.

Pen E. Bare ground. A gravelled pen slightly sloping and devoid of vegetation.

Pen F. Fly-proof concrete and brick loose box.

With the exception of the two lambs in F and one of the two in E, all became infected with *Moniezia*.

In 1931, uninfected lambs were again placed in pens A and B, both of which had been free from sheep for six months. These lambs began to pass the eggs of *Moniezia* in 27 to 31 days. One lamb received herbage cut from pen B, after it had been carefully examined, any insects and faecal matter being removed. This lamb showed evidence of infection on the 48th day. A lamb placed on clean ground along with infected sheep's faeces did not contract infection, nor did one which was drenched with ripe segments.

It was concluded that the nature of the ground plays no part in the development of the infective stage. If an intermediate host is required, it cannot be an aquatic one, nor can it be anything larger than a small ant, unless the infective stage leaves the intermediate host and lies dormant in the herbage. It was also shown

that ground may be infective in mid-summer, autumn or early winter and may remain infective for 11 months.

II. In the course of a previous experiment [SEDDON and McGRATH. (1931). *Rep. Dept. Agric. New South Wales*. No. 6. pp. 40-57.] eight months' old lambs infected with *Moniezia* were placed along with lambs of the same age, but free from *Moniezia*, on infective pasture. It was noticed that the uninfected lambs became infected, but that those which were already carrying *Moniezia* lost their infection and did not acquire any more.

The work here reported was carried out to ascertain whether this evidence of acquired immunity could be confirmed. Five experiments were arranged in which the immunity of the experimental lambs was tested by placing them along with uninfected controls on infective pasture. Of the experimental lambs, four had been previously infected with *Moniezia*, one had received subcutaneous injections of the macerated strobila of *Moniezia* and one had been drenched with the strobila.

In each instance the control became infected as also did the one which had received the subcutaneous injections, but the four lambs which had been previously infected, and the one which had been drenched with the macerated strobila, remained free.

III. The weekly observations on the faeces of the experimental lambs which have already been referred to in the two previous papers, provided the author with data on the period which elapses between infection and egg-laying and on the length of life of the parasite. It is concluded that *Moniezia expansa* reaches maturity and commences egg-laying in 40 to 50 days; that the eggs are passed by infected lambs for an average period of only 20 to 30 days, and that the length of the parasitic life of *M. expansa* is about 65 to 70 days.

IV. From observations on the eggs of *Moniezia expansa* and on those of other members of the Anoplocephalinae, the authors arrive at conclusions which for the most part differ from those of SINITSIN (1931), [see this *Bulletin*. 1. 302.]. Quoting from the authors' abstract, their conclusions are as follows:—

"(1) Changes in the pyriform apparatus develop within 13 days instead of 45 days. (2) In most eggs horns of the pyriform apparatus show no evidence of twisting during the drying process; greatest rotation of the horns observed was 180 degrees, not 540 degrees as figured by Sinitsin. (3) No evidence was found that the horns grow unequally, so conducing to rotation. (4) Gravid proglottids in our climate dry to a thin scale in a few days; isolated eggs collapse by drying in a few hours; the embryo resists drying for some time. (5) As drying progresses the embryo gradually shrinks, probably not surviving beyond three weeks. (6) The shell, derived from the ootype, is highly permeable. The substance of the pyriform apparatus less so. (7) The shell is easily ruptured, especially after drying. Released in this way, the pyriform apparatus can be made to expel the embryo by placing it in slightly warm water; the bulb swells, then ruptures at the end opposite the horns, the contraction of the capsule forcing out the embryo which soon claws away the embryonic membrane. (8) Sinitsin's view that the horns of the pyriform apparatus are used to bore into the host neglects an important law of physics, action equals reaction."

E. L. TAYLOR.

MANEGOLD, O. (1931). Über Cysticerkose, mit besonderer Berücksichtigung der beim Schwein und Schaf vorkommenden Finnen. [Cysticercosis with special reference to Measles in Pigs and Sheep].—*Schlachthof- u. Lebensmit.-über-Wach. Suppl. Deuts. tierärztl. Wschr.* 39. 85-87. 1 table.

In pigs in Prussia, cysticercosis, due to *G. cellulosae*, has decreased from 0.05 per cent. in 1903 to 0.0005 per cent. in 1930. Manegold also reviews the

literature dealing with *G. ovis* in sheep and *G. tenuicollis* in pigs and sheep, discussing the differential diagnosis between the latter and *G. cellulosae*.

T. W. M. CAMERON.

- I. FAIRLEY, N. H. (1931). **Intradermal Skin Tests and the Cercarial Complement Fixation Reaction in Schistosomiasis.** [Report of a demonstration at a Clinical and Laboratory Meeting of the Royal Society of Tropical Medicine and Hygiene].—*Trans. Roy. Soc. Trop. Med. Hyg. London*. **24**. 366-367.
- II. MCCOY, O. R., & MILLER, Jr., J. J. (1931). **Skin Reactions to *Trichinella spiralis* Antigen in Cases of Trichiniasis and Infections with *Trichuris trichura*.** [Paper presented at 7th Ann. Meeting, Amer. Soc. Parasitologists, New Orleans. Dec. 29th, 30th and 31st].—*J. Parasitol.* **18**. 123.

I. This test was demonstrated on two patients; the antigen consisted of a 1 per cent. saline extract of dried livers of snails infested with the cercariae of *Schistosoma spindale* and was injected into the dermis in amounts of 4 to 5 minims. Both patients developed wales which attained a diameter of 2 cm. within a few minutes so showing a positive reaction, (a wale 1 cm. or more in diameter being regarded as positive).

As a result of serological studies on infected animals, the complement fixation reaction now has abundant experimental support, but like the intradermal test gives a group reaction for the schistosomes. The Wassermann reaction technique, as outlined in the *Medical Research Committee Special Report Series*, No. 21, methods nos. 1 and 4, is very satisfactory, the only difference being the substitution of an alcoholic extract of snails' livers infested with the cercariae of some mammalian schistosome as the antigen. These extracts are highly antigenic and show no loss of activity after storage for as long as four years. As far as is known, other helminthic diseases do not give rise to fallacious reactions.

The report mentions several instances of the employment of this test with satisfactory results; in some of these the test had led to a diagnosis of schistosomiasis where it had not been possible to demonstrate the presence of eggs in the faeces.

II. Intradermal injections of the saline extract of *Trichinella spiralis* were made on a number of proved cases of trichiniasis, on cases diagnosed as trichiniasis, and on controls. Positive reactions were obtained in 87 per cent. of the proved cases of trichiniasis, in 46 per cent. of the cases diagnosed as trichiniasis and in 11 per cent. of the controls. A higher percentage of positive reactions was obtained among those persons who had recently been affected than among those who were ill from two to eight years previously. A number of the test subjects were infected with *Trichuris trichura* and 62 per cent. of these also gave positive reactions. The intradermal test with saline extract of *Trichinella spiralis* therefore cannot be considered as specific for trichiniasis.

E. L. TAYLOR.

REES, Gwendolen. (1931). **Some Observations and Experiments on the Biology of Larval Trematodes.**—*Parasitology*. **23**. 428-440. 2 tables, 10 figs. [3 refs.]

Observations were carried out on the liberation from snails of three species of cercariae which showed that the governing conditions are largely light and temperature.

Four *Lymnæa palustris* infected with *Cercaria limbifera* were observed over a period of five days and five nights and it was found that the numbers per snail liberated during the day time varied between 24 and 80, but that no cercariae were liberated between 9 p.m. and 9 a.m. If kept continually in darkness the emergence of cercariae is inhibited for 36 hours, after which a few are liberated but only during the day time. [A re-establishment of the rhythmical liberation even in the absence of light].

Similar observations were made on *Cercaria* "Z" (a new species) which was found to be liberated from the host snail, *Lymnæa peregra*, in numbers varying from 500 to 1,200 during the twelve hours of daylight. This species was found to be negatively phototropic, and it appears, therefore, that the limitation of the emergence of these cercariae to the day time must be explained by something other than phototropism.

Cercaria cambrensis I was found to respond to light in a very different way; some liberation from the host snail, *Lymnæa truncatula*, occurred during the whole of the 24 hours, but the larger number appeared during the night.

Placing *Lymnæa peregra* in water at a temperature of 5.5° to 8.5° C. was found to inhibit the liberation of cercariae even during the day time.

Notes are given on the locomotion of these cercariae and on their reactions to light and length of life after escaping from the snails. *C. cambrensis* was found to live for 48 hours and *Cercaria* "Z" for an average of 22 hours. At increased temperatures they are more active, but shorter lived.

A study was made of the effects of the parasites on the tissues of the snails in the infestation of *Lymnæa truncatula* with the cercariae of *Fasciola hepatica* and on the infestation of *Lymnæa peregra* with *Cercaria* "Z." One of the first indications of infestation is the appearance of black pigment granules in the tissues of the snail. The presence of the parasites in the so-called "liver" of the snail also becomes obvious. In light infestations, what remains of the normal liver tissue appears as dark patches, while in heavy infestations the liver tissue is almost entirely replaced by the parasites. The actual seat of the infestation is the connective tissue between the hepatic tubules; as a result of the activities of the parasites, the columnar cells of the tubules degenerate: the vitality of the snail does not, however, appear to be affected and, after the period of infestation has passed, the tissues gradually regain their normal state.

E. L. TAYLOR.

DISEASES, GENERAL.

RIEDMÜLLER, L., & STIHL, H. (1931). Urtikarielle und papulöse Berufsdermatosen der Tierärzte nach vaginalen Eingriffen beim Rind. [**Urticarial and Papular Occupational Dermatoses of Veterinary Surgeons contracted after Vaginal Manipulations in Cattle**].—*Schweiz. Arch. Tierhkl.* **73**. 588-595. 3 figs. [6 refs.]

This is a discussion of one case seen by the authors and of several cases reported by HUDDLESON and JOHNSON [(1930). *J. Amer. Med. Ass.* **94**. 1905.] and by HAXTHAUSEN and THOMSEN [(1931). *Arch. f. Derm. u. Syphilis.* **163**. 477.] of various types of skin eruption occurring in veterinary surgeons engaged in bovine obstetrical work.

HUDDLESON and JOHNSON [see this *Bulletin*. **1**. 10.] diagnosed their cases as "*erythema brucellum*," but the authors point out that in the actual tests reported there was a possible error as a bovine broth culture of *Br. abortus* was

used in the diagnosis and the resultant reaction may have been due to hypersensitivity to bovine body fluids.

HAXTHAUSEN and THOMSEN regarded their cases as of allergic reaction with relation to *Br. abortus*.

The case observed by the authors was manifested by a papulous efflorescence on the arm, together with eczematous plaques on the forearm and back of the hand. This occurred repeatedly after the vaginal examination of cows and lasted for from one to two hours.

The authors obtained a papular reaction in this case by rubbing a *Br. abortus* suspension from a dextrose and glycerine liver agar culture on the intact skin. The patient also reacted weakly to the agglutination test for *Br. abortus*.

86 out of 166 Swiss practitioners, who were asked, replied that they had suffered from skin eruptions after obstetrical work and 105 out of 325 Danish practitioners gave a similar reply.

GRÄUB, in an editorial note, stated that he believes that cocci are often the cause of this kind of skin trouble: he recommends antiviral therapy in such cases.

For prophylactic purposes, fat rubbed well into the arm is most reliable.

J. T. E.

GRÜNEWALD, K. (1931). Ueber die Aetiologie des Ekzems. [On the Etiology of Eczema].—*Inaug. Diss. Berlin*. [360 refs.]

This is a long thesis of over 100 pages dealing with all but the therapeutical aspect of eczema, and is written with reference to numerous relevant articles in human and veterinary medical literature.

In the introduction, the name eczema is discussed and its nature described. The pathogenesis and symptomatology of the disease in man and in domestic animals is outlined. The main part of the work is the discussion on etiology, which is considered in all its aspects: these are grouped under three main headings—predisposition, external causes and internal causes.

External causes are considered to be those of atmospheric, chemical, mechanical and parasitic origin. Internal causes are much more complex and are discussed under the following headings:—the connection between eczema and physiological processes; heredity; nutrition and internal medication; general diseases; diseases of internal organs (the several body systems are considered separately); and metabolic disturbances (uric acid diathesis, diabetes, exudative diathesis). Finally, "allergic eczema" is discussed.

All this is a review of the extensive literature on eczema; the author did not, however, undertake any experimental work in this connection. He concludes that the etiology of eczema is never simple and singular, but always complex. Both internal and external factors are involved and their nature and extent are still largely unknown. The sensitivity of the epidermal cells is increased by diseases of the internal organs, notably those concerned with excretion, and by the resultant presence of harmful substances (auto-intoxication); any external irritant can then exert its pathogenic effects.

J. T. E.

SEDDON, H. R. (1931). On the Occurrence of Lesions simulating Caseous Lymphadenitis.—*Austral. Vet. J.* 7. 141-143.

A paper read before the Annual General Meeting of the Australian Veterinary Association.

The author says that, while the great majority of purulent or caseo-purulent lesions in sheep in which the necrotic material is greenish in colour are due to the Preisz-Nocard bacillus, he has recently found that other organisms produce similar lesions. He quotes seven cases in which such organisms were found. These included :—abscess of the lung due to a diphtheroid other than the Preisz-Nocard bacillus ; actinobacillosis of the nasal mucous membrane ; subcutaneous suppuration associated with *B. pyogenes* alone or other diphtheroids, or *B. pyogenes* mixed with other organisms—*B. necrophorus* in one case ; and arthritis and pyæmia in lambs due to *B. pyogenes*.

The author emphasises the importance of establishing a bacteriological diagnosis when dealing with caseous lymphadenitis in sheep.

W. A. P.

BAYON, H. P. (1931). **Notes on the Pathology and Treatment of Neuro-lymphomatosis gallinarum observed on Fowls during eight Outbreaks.**—*Vet. Rec.* **11**. 1221-1224. 1 table, 6 text figs.

The author gives an account of the symptoms, pathology and treatment of cases of fowl paralysis on eight affected farms. He confirms the findings of MCGAUGHEY regarding the influence of the pullet strain on the prevalence of the condition and discusses the rôle of chronic coccidiosis, the common tape worm and of nutritional factors in relation to the etiology of the disease. Pathologically he differentiates the lesions found in the early and late stages. In the brain, the early lesions are of the nature of a lymphoid infiltration, but in the later stage the glial type of cell predominates. The early lesions in the peripheral nerves consist of reddening and swelling as a result of a slight hyaline and lymphoidal infiltration ; the well-known hypertrophic lesions occur only in the later cases. The author also describes blood changes and the visceral accumulations of lymphoid cells which, in one case, resulted in the formation of circumscribed lymphomata. He reports favourable results from treating a number of affected fowls with feeds of lettuce, skim milk and yeast, and considers lettuce to be the essential factor in this respect. He does not agree with the wholesale slaughter of an affected flock, but considers that the strain factor and dietetic conditions should first be investigated.

NORMAN HOLE.

KREDIET, G. (1931). Vermannelijking door een Ovariale tumor bij een Paard. [**Ovarian Tumour in a Mare showing some Male Characters**].—*Tijdschr. Diergeneesk.* **58**. 961-974. 7 figs.

There seems to have been some difference of opinion regarding the actual existence of any physical external characters of the male type in the mare referred to in this paper. It appears, however, to be agreed that there was a definite sheath-like structure around the clitoris, and there seems to be no doubt that the mare attempted to cover other animals.

Examination revealed enlargement of the right ovary. Ovariectomy was performed. The left ovary measured $7.7 \times 5.2 \times 4.5$ cm. and the right $9.9 \times 9.4 \times 8.1$ cm. Cysts were present in the left ovary which caused the surface to be bosselated. The right ovary was almost completely occupied by cysts of various sizes. The contents of the large cysts varied ; in some cases they were serous, and in others some blood was present. Hæmorrhage had taken place into the stroma at places. Histological examination failed to reveal the presence of any

normal ovarian tissue, follicles or corpora lutea, but the actual number of cysts present was found to be far greater than macroscopic examination indicated. There were large numbers of cysts of microscopic size. The cysts of all sizes were structurally similar and were lined with an epithelial layer several cells thick. After the operation the animal is said to have lost its male characters, the principal one of which would appear to have been, apart from the attempts to cover other animals, a male carriage of the body rather than a male form.

A. LESLIE SHEATHER.

RÜSCHER, W. (1931). Carcinoma solidum der Harnblase eines Pferdes mit unspezifischer Tuberkulose-Komplementablenkung. [**Carcinoma of the Bladder of a Horse with Non-specific Deviation of the Complement for Tuberculosis**].—*Arch. wiss. prakt. Tierhkl.* **64**. 29-34. 1 text fig. [31 refs.]

The author reviews the literature regarding the occurrence of carcinoma in the horse, but is not able to draw any very definite conclusions, as statements made by different authors show great divergence of opinion and because proof of the nature of the growth is not always given.

In the case described, as the result of clinical observations, blood counts and complement fixation tests, the diagnosis was "tumour-formation in the abdomen with pneumonia, most probably tuberculous."

The animal was a 9 or 10 year old mare in poor condition. The peritoneum, and particularly the part over the diaphragm, was covered with greyish-white nodules ranging in size up to that of a walnut. The peritoneal cavity contained two bucketfuls of a yellow inflammatory exudate. The intestines and spleen substance were normal. The nodules already described were present on the surface of the spleen, liver, stomach and pancreas. The external surface of the bladder presented an appearance suggesting interlacing fibrous bands, and nodules were scattered over the surface. Sharply circumscribed areas of congestion were present beneath the serous coat. The mucous membrane was thrown into prominent ridges and folds. Projecting into the bladder from the neck there was a pear-shaped firm growth measuring 5 cm. by 4 cm. The cut surface of this growth showed interlacing fibrous strands with red or grey areas between them. The other organs were normal except for some localised bronchitis in one lung. There was no tuberculosis. Histological examination showed that the tumours were solid carcinomata.

A. LESLIE SHEATHER.

WARRINGHOLZ. (1931). Die Weidetetanie (Grastetanie, Kopfkrankheit) der Rinder und die Tetanie bei Maul- und Klauenseuche. [**Meadow Tetany (Grass Tetany, Head Sickness) of Cattle and Tetany in Foot and Mouth Disease**].—*Berl. tierärztl. Wschr.* **47**. 745-750. 2 tables. [9 refs.]

The author gives a systematic description and reviews the literature of grass tetany in cattle in Holstein where the disease has been known for many years (since 1907). [For a description of grass tetany, the reader is referred to an abstract of a paper by GÖTZE (1931), see this *Bulletin*. **1**. 166. SJOLLEMA and SEEKLES (1930) *Biochem. Zeitschr.* **229**. 358, discussed the pathogenesis of grass tetany and allied conditions.]

In grass tetany there is a fall in blood magnesium and in blood calcium, but the ratio between them appears to be of the greatest etiological importance.

The author has often observed a condition of tetany in cattle affected with foot and mouth disease. It occurs almost exclusively in cows which become infected with foot and mouth disease while at grass and is usually associated with the drinking of much water. Cows drink much water during the initial febrile reaction and at the beginning of convalescence, and a condition of tetany is likely to follow. At the autopsy of cows that have died, large amounts of water are found in the stomach with distension of the urinary bladder and gall bladder; on the other hand, the subcutaneous connective tissues and the muscles are very dry, whilst the latter are dark red as in grass tetany. Pulmonary emphysema and congestion of the brain membranes are also common. The mortality is about 50 per cent. Treatment as for grass tetany (stimulants, udder inflation) is sometimes successful.

It is proposed that future cases shall be treated by the intravenous injection of calcium and magnesium chloride, as suggested by SjöLLEMA for grass tetany.

J. T. E.

SCHALK, A. F. (1932). **Deficiency Problems in Cattle.**—*J. Amer. Vet. Med. Ass.* **80**. 52-58. [24 refs.]

BRANDLY, C. A. (1931). **Nutritional Diseases of Poultry.**—*North. Amer. Vet.* **12**. No. 12. 45-48. [5 refs.]

BOUCHET, G., & BOUCHET, A. (1931). Un symptôme initial du rachitisme du porc. [**An Initial Symptom of Rickets in the Pig**].—*Bull. Acad. vét. de France*. **4**. 417-419. [1 ref.]

—. (1931). Rachitisme des carnivores. [**Rickets in Dogs**].—*Ibid.* 411-414.

Of the above four papers three are general, but incomplete reviews of the subjects given in the titles. The third paper is clinical.

The first paper is a brief review of certain publications dealing with deficiency problems in cattle. Such diseases as "bone-, wood- and leather-chewing," "soil eating" and "licking," which are fairly common amongst American dairy cattle, are ascribed to a lack of phosphorus and possibly of calcium. It is pointed out that the calcium content of the body is affected by magnesium salts in different ways, e.g. the sulphate, carbonate and acetate of magnesium result in excretion of calcium; the chloride, lactate and phosphate lead to its temporary retention whilst the glycuronate and the colloidal hydroxide of magnesium and also chlorophyll result in the prolonged retention of calcium. It is for this latter reason that burnt hay and, occasionally, ensilage lead to trouble, resulting from the fact that the chlorophyll is denatured and the magnesium compound is converted into the sulphate, this change leading to derangements of the calcium metabolism.

In the second paper nutritional diseases of poultry are reviewed. Avitaminosis is said to be not uncommon, lack of vitamin A leading to low hatchability and symptoms of unthriftiness. B-avitaminosis causes anorexia, emaciation, leg weakness and spasmodic twitching of head and limbs; deficiency of the anti-pellagra factor, B₃, results in scurfy skin and granular conjunctivitis in chickens. The absence of vitamin D leads to rickets. Excess of salts, such as those of phosphorus and perhaps calcium, may cause "slipped tendon" whilst excess of protein results in enteritis. Other troubles are briefly described.

The fourth paper is a general report upon a thesis dealing with rickets in the dog. The thesis apparently reviews the subject thoroughly, but this report is only notable for its insistence upon the manufacture of vitamin D in the liver and perhaps in other organs.

The third paper describes a skin condition in pigs that is considered to be a preliminary to true rickets in this animal. The animals look dirty, the skin is grey, damp, sweaty and sometimes wrinkled and covered with crusts and pustules. Incessant itching is present and the animals become dejected and cease to grow. The condition is compared with infantile eczema of humans and it is pointed out that both are cured by giving nitrogen rich diets, e.g. horse beans to pigs and soya meal to children.

W. R. WOOLDRIDGE.

IMMUNITY.

LANDSTEINER, K., & VAN DER SCHEER, J. (1931). **On the Specificity of Serological Reactions with Simple Chemical Compounds. (Inhibition Reactions).**—*J. Exp. Med.* **54**, 295-305. 4 tables. [13 refs.]

The reactions of certain immune sera produced by injecting "synthetic" antigens can be inhibited by numerous substances, provided these possess a chemical structure somewhat similar to that of the reacting group of the antigen used. To demonstrate this phenomenon "synthetic" antigens were made by coupling ortho-, meta- or para-amino-benzoic acid with protein and the corresponding immune sera were produced. The precipitin reactions of these immune sera with their respective antigens were examined under normal conditions and also in the presence of each of a number of substituted benzoic acids. Inhibition of the reaction, to some extent, was obtained with all the benzoic acids, but in every example given, except one, the inhibition produced in the presence of the o., m. or p. derivatives was definitely greater for the corresponding o., m. or p. amino-benzoic acid antigen. Thus, for example, of the o., m. and p. acids, the ortho acid series always inhibited most strongly the precipitin reactions of the ortho-amino-benzoic acid antigen. No inhibition was noted when the lower fatty acids were added, but with the higher homologues, such as caproic acid, some inhibition was obtained. It is suggested that the inhibition of the higher fatty acids is due, in part, to the capillary properties of these compounds and also in part, to the presence of the carboxyl group. Certain acyclic acids, such as α -thiophene carboxylic acid and α - and β -naphthoic acids, also induced some inhibition, but in all these instances the inhibition was less than that produced by benzoic acid itself. Here, then, is an example of specific inhibition but the specificity is not very marked.

Inhibitions of pronounced specificity can be effected, however, by building up antigens from proteins and chemical compounds of somewhat greater complexity, e.g. *l*-phenyl (para amino benzoyl amino) acetic acid or *l*-para amino tartranilic acid. The precipitin reactions of the antigens produced from these substances with their homologous immune sera were markedly inhibited solely by the corresponding acid itself, none of over ninety other compounds examined, of very diverse chemical structure, showing anything but the slightest inhibitory power. It is thus possible to demonstrate that, under appropriate conditions, the specificity of the inhibition reactions with synthetic, crystallized compounds is of the same order as that of the usual serum reactions and, further, it is possible to identify such compounds by serological tests as readily as proteins can be differentiated with the aid of precipitating sera.

W. R. WOOLDRIDGE.

ROSS, V. (1931). **Oral Immunization against *Pneumococcus* Types II and III and the normal Variation in Resistance to these Types among Rats.**—*J. Exp. Med.* **54**. 875-898. 34 tables. [6 refs.]

ROSS, V. (1931). **The Rôle of the Soluble Specific Substance in Oral Immunization against *Pneumococcus* Type I.**—*Ibid.* 899-923. 21 tables. [7 refs.]

I. The author has already shown that in rats the oral administration of dead pneumococci of type I produces an increased resistance to intraperitoneal or subcutaneous injection of virulent organisms of the same type. Young and old rats were equally susceptible to this type.

In contrast to this, considerable variation was demonstrated in the resistance of different rats towards type II pneumococci; in general, older rats survived much greater doses than younger ones, illustrating the acquisition of a natural partial immunity. The same was true for type III, but the immunity appeared later in life and was not of the same degree.

The production of an increased resistance following oral administration of dead pneumococci was demonstrated in the case of type II by dividing single litters into controls and experimental animals, and in type III by using young rats.

An active immunity was also produced by the Berkefeld filtrate from cells dissolved in bile-salt.

II. Protection against intraperitoneal injection of virulent organisms of type I pneumococci was obtained by feeding rats with the purified soluble specific substance of that type. The increased resistance resembled qualitatively that obtained by feeding whole or dissolved bacteria; one feeding was sufficient, the time of appearance and duration of the immunity were similar, the immunity could be renewed by another feeding, and it was type-specific.

The results of feeding whole pneumococci to mice were less regular than in rats and no protection was obtained by feeding soluble specific substance. The reasons for this are discussed.

A. W. STABLEFORTH.

TIMMERMANN, W. A. (1931). Zur Frage der Übertragung des Typhus "H" und "O" Agglutinin von Mutter auf Kind. [**The Passage of "H" and "O" Agglutinins for *Bact. typhosum* from Mother to Child**].—*Zeitschr. Immun. Forsch.* **70**. 388-399. 3 tables. [23 refs.]

The author has examined the blood serum, colostrum and milk of parturient women, and the blood serum taken from the umbilical vein of their offspring, for the presence of "H" and "O" agglutinins for *Bact. typhosum*. As many of the mothers had previously suffered from infection with *Bact. typhosum* and some had had prophylactic inoculation, the percentage of so-called normal agglutinins was high. It was shown that "H" agglutinins passed through the placenta in a percentage of cases, but normally were less concentrated than in the blood serum of the mother. Rarely or never was there any evidence of "O" agglutinins. On the other hand, "H" and "O" agglutinins were present in the colostrum usually more concentrated than in the mother's blood serum. The increased concentration was rather more apparent for "O" agglutinins. After 10 days' lactation both "H" and "O" agglutinins had practically disappeared from the milk. [The practical application of such phenomena has been taken advantage of in the case of the passage of antitoxin *via* the colostrum in the immunization of ewes against lamb dysentery. MASON, DALLING, & GORDON (1930). *J. Path. Bact.* **33**. 783.]

R. LOVELL

MUELLER, J. H., & KLISE, K. S. (1931). **A Method for the Agglutination of Hemolytic Streptococci.**—*J. Immunol.* **22**, 53-59. [4 refs.]

In the course of their work on several hundred strains of hæmolytic streptococci, the authors found that the addition of 2 per cent. of normal horse or rabbit serum to the saline used for the dilution of immune sera generally prevented spontaneous agglutination, whilst having no effect on specific agglutination.

Full details are given of the methods used. The basic culture medium was prepared from chopped beef heart 100 g., peptone (Parke-Davis) 10 g., sodium chloride 5 g., and water 1,000 c.c.

For the preparation of agglutination suspensions this medium was enriched with 0.1 per cent. glucose and 2.0 per cent. of normal horse serum. Cultures were usually grown for 48 hours at 37° C. and added directly to the dilutions of immune serum; the mixtures were incubated at 54° to 55° C. for 2 hours and read at once. With certain strains, by setting up tests at intervals of a few hours, the authors observed a remarkable sequence of spontaneous agglutination and complete inagglutinability, followed by perfect specific agglutination. The optimal period was usually 48 hours. Material for inoculation was grown in the same basic broth after the addition of 0.5 per cent. glucose. After 48 hours at 37° C., the organisms were washed and killed with 0.3 per cent. formalin.

A. W. STABLEFORTH.

- I. WHITE, P. B. (1931). **Observations on Salmonella Agglutination and related Phenomena. Fixation of Somatic Agglutinins by Receptors in Solution.**—*J. Path. Bact.* **34**, 825-829, 1 table. [5 refs.]
- II. WHITE, P. B. (1932). **Observations on Salmonella Agglutination and related Phenomena. Concerning an alcohol-soluble Antigen (Substance Q).**—*Ibid.* **35**, 77-89, 4 tables, 3 figs. [8 refs.]

I. Extracts of salmonella bacilli prepared by heating the bacilli in saline, and the carbohydrate-containing haptenes isolated by the antiformin method of MEYER, [(1930). *Zeitschr. Immun. Forsch.* **68**, 98.], when present in sufficient amount, are capable of fixing somatic agglutinins of the corresponding bacillary antiserum. The range of fixation by each type coincided with the distribution of somatic antigens. Solutions from (*S*) *Bact. ærtrycke* fixed "O" agglutinins of homologous serum and also "O" agglutinins for *Bact. paratyphosum* B, but not for *Bact. suipestifer* which contains a different "O" antigen. Solutions of the rough hapten fixed rough somatic agglutinins of all salmonella types. Specific carbohydrates prepared by the acid method [WHITE (1929). *J. Path. Bact.* **32**, 85.] did not effect any extensive absorption of agglutinins, although in precipitin tests the solutions appeared to be about equivalent to those prepared by the antiformin method. None of the solutions interfered in any way with flagellar agglutination. It is pointed out that, by the use of such solutions, an alternative method of performing somatic absorption tests is available. The technique involves adding constant amounts of the absorbing solution to varying dilutions of antiserum. The tubes are allowed to stand for 15 minutes to 2 hours at 37° or 45° C. and one drop of a thick suspension of bacteria is added, after which the tubes are incubated at 50° C. and later examined for agglutination. Adequate controls are included.

II. The author has obtained a protein "Q" by extraction of both S and R bacilli of the salmonella group with warm 95 to 97 per cent. alcohol in the presence of hydrochloric acid. It is antigenic and stimulates precipitating antibodies in the serum of rabbits. It occurs in all the serological types of the salmonella

group and also in certain dysentery, coliform and proteus bacilli. There is no evidence of any specific differences between "Q" isolated from the various bacteria mentioned, although it is suggested that the amount present may vary considerably. "Q" antiserum flocculates *p* forms, (old laboratory strains of salmonella which react only slightly with R sera and appear to lack any appreciable amount of the characteristic S or R carbohydrate haptenes) without respect to type, also R forms but not S forms. On the other hand, suspensions of smooth (S) *Bact. ærtrycke* were capable of absorbing from a "Q" serum (prepared against *Bact. ærtrycke* "Q" fraction) agglutinins for R and *p* forms. Although extraction of the "Q" substance does not damage the carbohydrate haptenes, yet it causes almost complete loss of somatic agglutinability of the treated bacilli. Attempts to return this loss by adding "Q" to mixtures of treated bacteria and antiserum have been partly successful and a theory is proposed that somatic agglutination is partly due to "Q" because of its precipitation by salt in physiological concentration.

R. LOVELL.

SPENCER, R. R. (1931). **A Note on the "Zone Phenomenon" in Human Sera. A Comparison of Antitularense with Anti-abortus Sera.**—*Publ. Hlth. Rep. Washington*. **45**. 2383-2385. 2 tables.

Of 2,000 samples of human sera examined for a diagnosis of undulant fever or tularæmia, 329 were positive against *Bact. tularensis* and 174 were positive against *Br. abortus*. 19.7 per cent. of the positive anti-*Bact. tularensis* sera showed a definite inhibition zone in one or more tubes, mainly in the dilutions up to 1:40. Of the positive anti-*Br. abortus* samples, 30.1 per cent. showed zones of inhibition which were generally wider than those of the previous series.

R. LOVELL.

FRENDZEL, J., & SZYMANOWSKI, Z. (1931). Para-agglutination des Bac. Bang mit Typhusserum. [**Para-agglutination of Bang's Bacillus with Typhoid Serum**].—*Zlb. Bakt. I. (Orig.)*. **121**. 448-451. 5 tables.

The authors find that the cultivation of Bang's bacillus in series in typhoid culture filtrates results in the change of the organism into the typical para-abortus bacillus. These modified organisms are difficult to emulsify with salt solution, give pronounced thermo-agglutination and show marked reduction in their agglutinability with specific abortion serum and in their immunizing powers.

The authors are in possession of a number of strains which produce para-agglutination, and they have carried out a series of experiments to determine their antigenic characters, using antisera prepared from rabbits. The results obtained are given in short tables.

A. LESLIE SHEATHER.

LEVINE, P., & LANDSTEINER, K. (1931). **On Immune Isoagglutinins in Rabbits.**—*J. Immunol.* **21**. 513-516. 1 table. [11 refs.]

The authors record here additional observations on the production and properties of iso-agglutinins in rabbits. One donor was used for each recipient, and from the former 10 c.c. of blood were drawn to which 1 c.c. of 5 per cent. sodium citrate was added. The blood cells were centrifuged and hæmolyzed by the addition of 18 c.c. of sterile distilled water. After several minutes, 2 c.c.

of 10 c.c. per cent. sodium chloride were added and the mixture was shaken and filtered through gauze. Injections of this were made intraperitoneally at intervals of three to four days. After several injections, the serum of the rabbits reacted with the type of bloods used for immunisation and some rabbits reacted with a large number of other samples of rabbits' blood. It is suggested, therefore, that there are in rabbits numerous individual blood differences as in goats, cattle and chickens.

R. LOVELL.

OTTENSOOSER, F. (1931). Untersuchungen über Isoagglutinogene. [**Studies on Iso-agglutinogens**].—*Zlb. Bakt. I. (Orig.)*. **122**. 73-75.

KRAL, A. (1931). Über Isoagglutinine im Liquor cerebrospinalis. [**Iso-agglutinins in Cerebrospinal Fluid**].—*Med. Klinik*. 659-660. 2 tables, 2 figs. [2 refs.]

The first paper is a report of a series of hæmolysis inhibition experiments which demonstrate that the stroma of red blood corpuscles is especially rich in group-specific substances. Experimentally the red cells are lysed with distilled water and the solution made up to the strength of physiological saline by the addition of concentrated salt solution. This suspension is centrifuged and the deposit, when suitably resuspended and mixed with the test serum, yields a much stronger agglutination than that obtained when the salt treatment is omitted. A series of four hundred experiments has been carried out both by the old and the new methods and in only 1 per cent. of results has disagreement been obtained.

When the serum of most rabbits is treated with group A human cells it is able to lyse sheep blood corpuscles in the presence of complement, but if group A substance be also added then hæmolysis is inhibited. This reaction is utilised in order to demonstrate the presence of group A substance in the cellular stroma. The effect of the addition of stroma to a series of hæmolysis experiments is compared with the effect obtained by the addition of the supernatant fluid from which the stroma has been obtained. In this way it is shown that 99 per cent. of the A group specific substance is present in the corpuscular stroma. Hence stroma, prepared in the way described, forms an excellent starting material for chemical and serological analysis.

In the second paper iso-agglutinins have been demonstrated in 55 cerebrospinal fluids obtained from a variety of cases in the Prague university psychiatric clinic. The agglutination titre of the fluids was considerably lower than that of the sera. It is assumed that the iso-agglutinins in the cerebrospinal fluids result from an increased permeability of the blood-fluid boundary to the serum.

W. R. WOOLDRIDGE.

TRAWINSKI, A. (1931). Participation de la peau à la formation des agglutinines. [**The Part played by the Skin in the Formation of Agglutinins**].—*G. R. Soc. Biol., Paris*. **107**. 77-78. 2 tables.

TRAWINSKI, A. (1932). Experimentelle Untersuchungen über die Rolle der Haut als Agglutininbildungsstätte. [**Experiments on the Rôle of the Skin in the Formation of Agglutinins**].—*Zlb. Bakt. I. (Orig.)*. **123**. 336-340. 5 tables. [1 ref.]

These two papers endeavour to bring out the importance of the part played by the skin in the formation of antibodies in the animal organism. Actually

the experiments cited in the French paper are also quoted in that published in German.

Experimentally, transplants of skin were taken from hyperimmunized rabbits and grafted on to normal rabbits, the skin removed from these latter animals being transferred to a second series of normal rabbits which thus acted as controls. By testing for the presence of agglutinins it was shown that the animals which received the transplants from hyperimmune rabbits produced antibodies, whereas the control animals, which had received normal skin transplants, showed no antibody production. These results may be explained to some extent by the strong development in the skin, especially in the rabbit, of the reticulo-endothelial system. That the skin transplant does exert an antibody-producing power dependent upon its physiological survival was demonstrated by inducing artificial necrosis of the transplant during the course of the antibody production, when the agglutinin titre ceases to rise and begins to fall. Further, no antibody formation resulted from the injection into normal animals of extracts of skin of hyperimmunized rabbits. Several different organisms were used for the hyperimmunization, but similar specific results were always obtained.

W. R. WOOLDRIDGE.

THOMPSON, R., & BUCHBINDER, L. (1931). **Flocculation of Vaccinial Virus-Tissue Suspension by Specific Antisera.**—*J. Immunol.* **21**, 375-392. 4 tables. [8 refs.]

The flocculation of vaccinial virus-skin suspensions by homologous antiserum, noted by GORDON and utilised by BURGESS, CRAIGIE and TULLOCH in the diagnosis of variola, has been confirmed. The fact that the same antigens are flocculated by immune sera prepared with brain virus and testicle virus, but not by sera prepared with normal rabbit skin, normal brain, normal testicle or streptococcal skin lesions indicates that the reaction is specific. Sera from rabbits which had recovered from extensive vaccinial skin infections did not flocculate the virus-skin suspensions. Brain and testicle virus suspensions were not suitable flocculation antigens in that they were unstable, sometimes flocculating spontaneously and sometimes refusing to flocculate in the presence of specific serum. Control suspensions of normal skin, or of skin with streptococcal lesions were not flocculated. Calf lymph and crusts from a smallpox case were readily flocculated.

Comparison of flocculating and neutralising potency usually showed a marked correlation, although occasionally the neutralising titre was high in the absence of any flocculating power.

The flocculating antibodies were specifically absorbed by the virus-skin suspension; there was also some evidence of absorption by the non-flocculable vaccinial brain and testicle suspensions. The brain and testicle viruses had been passed in rabbits for many generations.

A. W. STABLEFORTH.

WITTE, J., & SCHAAF, J. (1931). Über die Spezifität und therapeutische Wirkung von Gasödemseren. [**The Specificity and Therapeutic Action of Gas Oedema Sera**].—*Arch. wiss. prakt. Tierhkl.* **64**, 61-82. [3 pages of refs.]

The bacillus of malignant oedema is a not infrequent cause of gas oedema following injuries and in parturition cases. It is remarkable that, while immune

sera played an important part in the treatment of similar cases during the war, little or no use has been made of such sera in civil veterinary practice.

In the authors' own experiments, sheep were largely used for the production of the antisera as they are particularly suitable for the purpose; horses were also used. The antigen consisted of whole cultures introduced subcutaneously. Immunization was begun with the inoculation of formolised cultures, followed by virulent broth cultures. White mice were used for the tests. Tabular statements show the results obtained.

The authors find that it is possible to immunize animals, either passively or actively, against the bacillus of malignant œdema (Koch-Gaffky).

The protective value of the sera can be well titrated by the use of white mice. Definite doses of infective material can be given by using whole cultures which have been dried *in vacuo*. The most satisfactory results were obtained when the culture was injected subcutaneously, the antisera being simultaneously injected by either the intravenous or the intraperitoneal paths.

In experiments in which the culture was subjected to a preliminary sensitization with serum at body temperature, it was found that even the normal serum used in the controls had a definite effect upon the cultures.

The antisera were found to possess very valuable prophylactic and anti-toxic properties, and it seems possible that they would be of value in practice.

There is no doubt as to the specificity of the antisera prepared with the bacilli of malignant œdema and blackquarter.

A. LESLIE SHEATHER.

GARD, S., & EULER, H. (1931). Über einen temperaturempfindlichen Amboceptor-Komplementstoff. [**A Thermolabile Amboceptor-Complement Substance**].—*Acta Med. Scand.* **75**, 440-449. 6 figs. [10 refs.]

The authors accidentally discovered that 0.2 c.c. of fresh sheep serum hæmolyses completely rabbit corpuscles without the addition of complement. If the sheep serum be inactivated by heating to 56° C. it cannot be reactivated by the addition of guinea pig complement. It is shown that sheep serum contains two different substances, each hæmolytic against rabbit blood. One of the substances is a typical amboceptor that is quantitatively bound by blood corpuscles at 0° C.; it is thermostable and brings about hæmolysis in the presence of complement. The other, on the contrary, is scarcely bound at all at 0° C. but is completely taken up at 37° C.; it can apparently work in the absence of complement although its activity may be increased by the presence of this substance. Further work is required to obtain from this thermolabile substance a complement-free amboceptor and to show that this purified product possesses the same properties.

W. R. WOOLDRIDGE.

PUBLIC HEALTH.

PORCHER, Ch., & TAPERNOUX, A. (1931). Les maladies d'origine animale transmissibles à l'homme par le lait. [**Diseases of Animal Origin transmissible to Man by Milk**].—*2me Congrès Internat. Path. comp.* 198-218. [46 refs.]

A review of some of the more important facts already ascertained, and of the methods by which transmission may be avoided.

The following diseases are considered:—undulant fever and epizootic abortion of cattle, tuberculosis, diseases whose transmissibility by milk is rare or controversial (foot and mouth disease and anthrax) and diseases caused by certain organisms regarded as accidentally pathogenic for man; in the latter category are included streptococci and organisms of the coli-paratyphoid group. [The necessary distinction is not made between streptococci which are the normal cause of bovine mastitis and non-pathogenic for man, and those which are found in the udder as a result of implantation from a human source and which may therefore be the source of serious epidemics.]

Under the heading of prophylaxis the authors discuss the control of milk through the various stages before it reaches the consumer.

They ask for the adoption in France of methods of control similar to those already in operation in certain other countries, including a quantitative and qualitative control of bacteria, and a system of grading. In the absence of this, the authors recommend general pasteurisation, or at least pasteurisation of milk from tuberculin reactors and animals excreting brucella, a more rigid enforcement of the laws relating to methods of pasteurisation, and the prevention of the custom of adding alkaline substances to the milk in order to mask the changes caused by bacteria.

A. W. STABLEFORTH.

GUTHRIE, E. S., ROADHOUSE, C. L., & RICHARDSON, G. A. (1931). **Corrosion of Metals by Milk and its Relation to the Oxidized Flavours of Milk.**—*Hilgardia (California, U.S.A.)* 5. 425-453.

The effect of the exposure to sweet milk of a number of metals and their alloys has been examined from the view-points of loss in weight of the metal and of development of "oxidized" flavour in the milk. Certain chromium-nickel alloys, when well polished, pure aluminium, glass enamel and carefully tin-plated metals show little or no losses in weight and produce no oxidized flavours under these conditions. Certain other chromium alloys, whilst losing little in weight, yet produce slight oxidized flavours in certain milks. Copper, copper alloys, tin-plated copper, chromium-plated copper and pure nickel lose weight and produce oxidized flavours in the milk. Aeration of the milk during pasteurisation increases the tendency to the production of oxidized flavours in this process.

W. R. WOOLDRIDGE.

ELSDON, G. D., & STUBBS, J. R. (1931). **The Freezing Point of Milk and its Applications.**—*J. Soc. Chem. Indust.* 50. 135-141. 5 tables. [1 page of refs.]

A review of the importance of the freezing-point determination of milk, but containing a large number of original observations. It is concluded that the freezing-point of milk is less variable as between herd and herd or animal and animal than any other single determination made in the examination of milk. If one constituent of the solids-not-fat is lowered then the other constituents of the solids-not-fat tend to increase so that the osmotic pressure of the milk remains constant. The depression of freezing-point obtained by the authors for a large number of genuine milks ranged from 0.533°C . to 0.559°C ., with an average of 0.543°C . With diseased animals the depression is nearly always greater than normal; on only one occasion, with an individual cow, has it been shown to be less than 0.530°C ., when it was 0.523°C . The authors conclude

that, provided an efficient apparatus is used, the determination of the freezing-point of milk is much the most satisfactory method of detecting added water: the detection of 5 per cent. (or even less) of added water is comparatively simple using the Hortvet apparatus.

A detailed description is given of this apparatus and the method for freezing-point determinations, together with a discussion of possible sources of error. The principle of this apparatus makes use of a Dewar flask and the temperature is lowered by means of the suitable evaporation of ether.

W. R. WOOLDRIDGE.

DAVIES, W. L. (1931). **Observations on the Copper and Iron Content of Milk and other Dairy Products.**—*J. Dairy Res.* 3. 86-92. 1 table. [6 refs.]

WILLIAMS, W. (1931). **The Determination of Copper and Iron in Dairy Products.**—*Ibid.* 93-100. 4 tables. [11 refs.]

The determination of the copper and iron contents of milk products is important in view of the fact that traces of these metals accelerate certain bacterial oxidations and induce flavour deterioration.

The first paper contains the results of the determination of the copper and iron contents of the following samples of milk products; fresh milk—37; pasteurised milk—39; (iron only 10), sterilized milk—4; cheese—7, (several varieties); dried milk—2 and butter from various sources—28. From the milk analysis it is deduced that "oiliness" in milk can be expected when the copper content exceeds 1.5 p.p.m. (parts per million). The copper content of dried milk is the value expected from the content of the fluid, but the iron content exceeds that expected. The copper content of cheese is very variable; that of cheeses made in copper vats may be very high, e.g. up to 18 p.p.m. Butter contains an average of 0.5 p.p.m. copper and 1 p.p.m. iron, but that made in factories has usually higher contents. Examples are given illustrating the importance of chemical analyses of milk for copper at different stages of processing when "oiliness" is obtained in the milk. In this way the portion of the plant that is losing much copper to the milk may be detected, repairs effected and wholesome milk products afterwards secured.

The copper was determined by one of the following three micro-methods, the ferrocyanide, the xanthate or the pyridine-thiocyanate method, the author preferring the second. The iron was determined by the thiocyanate colorimetric method.

In the second paper the estimations were made on butter and cream and the methods used are given in much greater detail. A method of wet-ashing is described whereby large quantities of butter or cream can be conveniently handled. A colorimetric method for the determination of iron—a modification of the ferric ferrocyanide method—is described. Descriptions are given of the xanthate and the sodium diethyl-dithio-carbonate methods used for estimating copper; both methods give satisfactory results, but the latter is the more sensitive and less liable to error from possible contamination.

A number of results of analyses of New Zealand cream and butter are given. The normal content of superfine butter is given as 0.2 or 0.25 p.p.m. of copper and 0.5 to 1.0 p.p.m. of iron, but with second grade butter the values for iron are higher. The copper values are lower than those obtained for New Zealand butters in England by DAVIES in the first paper. A brief description of the equipment and of the process of manufacturing butter in New Zealand is given.

W. R. WOOLDRIDGE.

THERAPEUTICS.

HERZBERG, K. (1931). Versuche zur chemischen Beeinflussung des Vakzinivirus. [The Effects of Chemicals upon Vaccinia Virus].—*Zlb. Bakt. I. (Orig.)*. **122**. 231-236. 1 table. [5 refs.]

The author gives a long list of organic and inorganic substances which were tested with regard to their destructive effect in various dilutions upon vaccinia virus. Some, e.g. potassium permanganate, copper sulphate and methylene blue, were effective even in dilutions ranging from 10^{-4} to 10^{-6} . It was remarked that, in the case of methylene blue, strong solutions (10^{-3}) were less effective than weak ones. Experiments showed that exposure to light played an essential part in this phenomenon, the action of the methylene blue being photodynamic so that the stronger solutions absorbed the light, whereas the weaker ones failed to do so. This explains why the weaker solutions were more destructive to the virus.

A. LESLIE SHEATHER.

BAUDET, E. A. R. F. (1931). Über die Wirkung von Thymol und des Thymolpräparates Carvasept auf die Trichineninfektion der Ratten. [The Action of Thymol and of the Thymol Preparation called Carvasept on Trichinella Infection in Rats].—*Arch. Schiffs- u. Tropen-Hyg.* **35**. 449-461. 8 tables. [10 refs.]

The beneficial results obtained from the use of thymol in cases of human trichinosis have been recorded on several occasions, and the author of this paper has carried out tests on infected rats in order to ascertain whether these observations could be confirmed experimentally.

Equal portions of trichinosed flesh which had first been finely minced and thoroughly mixed were fed to each of the experimental rats in order that the level of infection might be as constant as possible. The drugs used were thymol and "carvasept" which is a proprietary preparation containing a similar compound of the thymol series.

The doses used were as large as could be well tolerated by the rats so that their maximum action would be produced and might be observed when a comparison was made at *post-mortem* examination between experimental and control animals.

Eight rats were used in the first experiment; they were given 4 to 14 subcutaneous injections of thymol in daily doses varying between 0.375 g. and 0.99 g. per kg. of body weight. In the second experiment, the oral administration of thymol was tried, commencing one day after the rats had received the infective feed of trichinosed flesh. Ten rats were used in this experiment; they were given between two and eight daily doses *per os* varying from 0.125 g. to 0.35 g. per kg., followed in four instances by a course of daily subcutaneous injections.

No indication was obtained in these experiments of any action on *Trichinella* either in the intestine or in the muscles.

Carvasept was tested in a similar way, first on a series of rats by subcutaneous injection only and secondly by oral administration followed by subcutaneous injection. Doses given *per os* varied from 0.15 g. to 0.3 g. per kg., and those given subcutaneously from 0.15 g. to 0.25 g. per kg., up to 17 doses being given in some instances.

Comparison between the 21 experimental rats and the 8 controls used in these two experiments did not, however, give a definite indication of any action

either on the worms in the intestine or in the muscle. Some of the rats which received the oral administration showed a smaller number of worms in the intestine than did the controls, but that difference might easily be accounted for by the variation in the original infection of the experimental rats which it was found impossible to avoid.

E. L. TAYLOR.

DE RIVAS, Damaso. (1931). **Intestinal Parasitism, Diagnosis and Treatment with Use of Glycero-Sulphate Solution and Intestinal Lavage with Hot Salt Solution.** [Paper presented 7th Ann. Meeting, Amer. Soc. Parasitologists, New Orleans, Dec. 29th, 30th and 31st].—*J. Parasitol.* **18**. 128.

The author recommends the irrigation of the human intestine for 5 to 10 minutes with solutions at 45° to 47° C. for the treatment of protozoan and metazoan parasites. For the small intestine 1 to 2 ozs. of equal parts of glycerine and a 30 per cent. magnesium sulphate solution is injected through the duodenal tube, followed by 1 to 2 litres of salt solution from a tank at 52° to 55° C. For parasites in the large intestine, a rectal tube is introduced into the descending colon and 1 to 2 litres of 1 : 5,000 copper sulphate injected from a tank at the temperature of 50° to 55° C. [HALL and WIGDOR in 1918 tried gastro-intestinal lavage with water at body temperature for the removal of parasites from dogs, but found it to be very inefficient. In 1926, HALL and SHILLINGER, following the recommendation of de Rivas, repeated the experiment, using water at 50° C.; half of the experimental dogs were killed as a result of the high temperature, but only a proportion of the worms were removed.]

E. L. TAYLOR.

KRÜGER, J. (1931). Versuche mit Harmin bezw. Banisterin bei Hunden. **[Experiments with Harmin on Dogs with relation to Banisterin].**—*Inaug. Diss. Berlin*. [32 refs.]

This work was performed in order to test the therapeutic action of harmin on mammals, to establish correct dosages and to find out whether a tolerance is developed towards it.

Harmin is an alkaloid obtained from the plant *Peganum harmala*, which occurs plentifully in North Africa, Southern Russia and mid-Asia. "Harmin-Merck," the hydrochloride of harmin, was employed in these experiments.

Banisterin, an alkaloid of the plant *Banisteria Gaapi*, indigenous to South America, has been known to pharmacologists for many years and it is now held to be chemically identical with harmin.

The toxicological action of harmin has been tested by various workers and it is supposed that it acts specifically on the extra-pyramidal motor nerve tracts. In dogs it may cause a train of symptoms very similar to those of rabies.

In the experiments, two groups, each consisting of four white mice and two healthy dogs, were employed. In mice the minimal acting dose was found to be 0.004 to 0.006 mg. per gramme body weight. The mice showed accelerated respiration and muscular tremors within 10 minutes of subcutaneous inoculation. Recovery to normal followed in about 25 to 60 minutes. No cumulative action was observed, but a tolerance to the drug was developed.

The minimal acting dose was 0.004 mg. per gramme body weight in dogs; it caused acceleration in respiration and a rise in temperature. With a dose of 0.0046 mg. per gramme body weight, there was in addition salivation, muscular

tremors and vomition. A dose of 0.01 mg. per gramme body weight caused tremors of the whole body musculature in both dogs; one remained conscious and obedient, whilst the other became fierce and barked and bit anything within reach.

Harmin has been used therapeutically in various types of paralysis in human beings. The author treated 13 paralysed dogs with harmin, but could not observe that it was of any therapeutic value. In a few cases which recovered, no definite connection between the cure and the harmin therapy could be demonstrated.

J. T. E.

VON KNEBEL, G. (1931). Versuche mit der Greifswalder Farbstoffmischung in der Wundbehandlung. [**Experiments in Wound Treatment with the Greifswald Dye Mixture**].—*Inaug. Diss. Berlin*. [40 refs.]

The dissertation is introduced by a brief review on the actions and uses of the various aniline dyes in therapeutics and bacteriology. The limitation of the specific action of single aniline dyes to single species or even strains of bacteria makes them as a rule unsuitable for indiscriminate use in surgical practice. To eliminate this shortcoming a number of basic aniline dyes were made into a mixture, the "Greifswalder Mischung" (Merck), for use as an antiseptic solution. The constituents, whose individual bactericidal action is first described, are methyl violet (1:1,000), brilliant green (1:1,000), Hoffmann's violet (1:1,000), malachite green (1:1,000), safranin (1:500), Magdala red (1:500) and toluidin blue (1:500).

LINDNER (1923) tested the action of the Greifswald mixture from the veterinary point of view on purulent conjunctivitis in dogs (20 cases) caused by staphylococci and streptococci, and on diplococcal balanitis in dogs (12 cases). Success was striking in the former but the mixture was useless in the latter.

The author first tested the action of Greifswald mixture on healthy dogs in order to find out whether it is irritant to raw wound surfaces or when injected subcutaneously, and found that it was non-irritant in each case. It was then used in 22 wound cases of various kinds in dogs. A summary of the author's results are as follows:—

The Greifswald mixture is an efficient wound antiseptic; it inhibits exudation in wounds, it is deodorant, it has only a slight stimulating effect on wound granulations, it is non-irritant to animal tissues and it is not poisonous.

Practical instructions for its use are given: the intense blue staining it produces in diseased tissues is not taken up by healthy tissue; this has a practical application.

J. T. E.

POISONS AND POISONING.

HEDSTRÖM, H. (1932). Förgiftning med fluornatrium hos hund. [**Sodium Fluoride Poisoning in the Dog**].—*Skand. Vet.-tidskr.* 22. 55-61. 3 figs. [2 refs.]

The author tested the toxic action on two dogs of a rat poison "rattoxin," whose toxic principle is sodium fluoride.

BOURGEOIS and KOLIPINSKI (1914) observed poisoning in a dog by "rattoxin," and LARSSON (1923) found that it is toxic for swine, cats, fowls and guinea pigs.

Two dogs of the same breed, weight and age were dosed *per os* with "rattoxin" in an egg yolk (2 g. and 1 g. per kg. body weight respectively). Ten minutes after dosage both dogs began to salivate and vomit and became affected with diarrhœa. Five hours later one dog still showed salivation and diarrhœa, whilst the other was recovering: 20 hours after dosage the former dog died and the latter recovered by the following day.

Post-mortem examination of the fatal case revealed hæmorrhagic gastro-enteritis, hepatitis and nephritis.

A brief allusion is made to 3 cases of sodium fluoride poisoning in dogs examined at Stockholm Veterinary College in 1930. Diagnosis was confirmed clinically in every instance. The morbid changes corresponded with those observed in the experimental case (*supra*).

J. T. E.

RABOTTI, Gello. (1931). Intossicazione collettiva di bovini con nitrato di sodio. [**Mass Poisoning of Cattle with Nitrate of Soda**].—*Nuovo Ercol.* 36. 365-373. [13 refs.]

This paper records a case of poisoning in cattle as the result of the administration of nitrate of soda in mistake for sulphate of soda. Each animal received approximately 500 g.

At the *post-mortem* examination, gastro-enteritis and acute myocarditis were the important lesions found.

A. LESLIE SHEATHER.

PHYSIOLOGY.

LINTON, R. G. (1931). **The Composition of Mare's Milk**.—*J. Agric. Sci.* 21. 669-688. 11 tables. [11 refs.]

One hundred and forty-two samples of milk from mares have been analysed; of these thirty-eight were taken during the period of colostrum secretion. The usual methods were followed for the determinations of proteins, total solids and ash; the fat was estimated by the Werner-Schmid or the Gerber methods but the lactose was calculated by difference as it was "found impracticable to estimate the sugar directly." The average composition of the mares' milk is given as total solids 10.96 per cent., protein 2.69 per cent., fat 1.59 per cent., sugar 6.14 per cent. and ash 0.51 per cent. These values agree with those obtained by continental workers except that for continental mares the average ash content appears to be 0.38 per cent.

The author examined milks obtained from several British breeds although the numbers of hunters and ponies were small. No appreciable variation in the constituents of the milk is notable in the different breeds, except with the mineral matter. The ash content increases with increase in weight of the breed. The colostrum of mares resembles that of cows.

The occurrence of œstrum in the mare frequently leads to nutritional disturbance in the sucking foal. Milks with high fat or very low sugar content also appear to lead to trouble with foals, but milk poor in fat or with a slightly high sugar content does not appear to have any deleterious effect. These variations are discussed fully. The milk of aged mares is generally of good quality with a tendency towards richness.

W. R. WOOLDRIDGE.

REINHARDT, R. (1931). Ueber das Aufhalten der Milch bei Kühen. [**On the Withholding of Milk by Cows**].—*Berl. tierärztl. Wschr.* **47**. 667-669. 1 fig. [12 refs.]

This paper is introduced by quotations from history and travel tales dealing with the successful prevention of the withholding of milk by cows by blowing air into the rectum and vagina at milking time.

The author attempts to explain the physiology of voluntary milk retention and the way in which it is overcome by air inflation. He considers that, amongst other factors, a condition of psychoneurosis may sometimes be associated with retention.

J. T. E.

EDINGTON, J. W., & ELLIOT, A. (1931). **The Blood Content of Muscle of Pigs slaughtered by various Methods**.—*Vet. Rec.* **11**. 1303-1305. 4 tables. [3 refs.]

The authors investigated the amount of blood left in the muscles of pigs after slaughter by using (1) the captive bolt pistol with delayed bleeding; (2) the same instrument with immediate bleeding; (3) direct bleeding (unstunned), and (4) MULLER'S method (Electrolathaler). Twelve pigs were used in each series and, after trying calorimeter, estimation of oxygen consumption and refraction tests, the test adopted was that of spectrophotometry which the authors state gave excellent results. The findings were as follows:—

Taking the blood content of muscle killed by No. 1 method as 100, then No. 2 method represented 86, No. 3 method 70 and No. 4 method 60. These facts are very interesting because some bacon curers have constantly maintained that it is impossible to cure bacon when pigs are killed by any mechanically operated instrument.

T. D. YOUNG.

ADRIAN, E. D., BRONK, D. W., & PHILLIPS, G. (1932). **Discharges in Mammalian Sympathetic Nerves**.—*J. Physiol.* **74**. 115-133. 10 figs. [11 refs.]

Using a technique described in the paper the persistent discharges which occur in mammalian sympathetic nerves in the cat and rabbit have been investigated by amplifying the potential waves in the nerve and recording them photographically. From observations on one experiment, the waves, which are slow diphasic potential charges, appear to be conducted at a rate of about 0.8 metre per second. The larger waves are mostly post-ganglionic and they are probably due to volleys of impulses occurring in groups of sympathetic fibres, since they are several times as great as the action potentials produced in a nerve of the same size by single motor or sensory fibres. Some of the waves are obviously complex and due to volleys which are not quite simultaneous.

The discharges which have been recorded are mainly concerned with vaso-constriction. In the majority of the experiments the waves tend to occur in groups with the frequency of the heart beat or of respiration. The respiratory grouping is due to a direct action of the respiratory centre on the vaso-motor centre, for it persists in the curarized animal after artificial respiration has been stopped and the outbursts in the sympathetic are still in phase with the motor discharges in the phrenic. When the respiratory grouping occurs the maximum discharge coincides with inspiration.

W. R. WOOLDRIDGE.

- ENOCKSSON, B. (1931). **On the Influence of Electrolytes on the Suspension Stability of the Red Corpuscles.**—*Acta Med. Scand.* **75**. 360-401. 22 tables, 19 figs. [2½ pages of refs.] [In English.]

In the experiments here described the effect of the addition of sodium chloride to blood on the suspension stability reaction (S.R.) is examined. The added salt concentration was varied from 0 to 1.64 per cent. generally, and occasionally up to 2.4 per cent. The S.R. was usually read after 1, 2 and 24 hours. All the bloods, except two, were obtained from diseased human beings, suffering from a variety of complaints.

The author claims that the experiments demonstrate that electrolytes are a determining factor in the rate of sedimentation of blood corpuscles. With the normal bloods the S.R. does not appear to be affected by the addition of salt solutions of the concentrations used, but with pathological bloods that show a high rate of sedimentation, the stabilizing effect of the addition of salt solutions is marked, especially with the one and two hour values.

Red cells in one and the same suspension can be divided, under favourable conditions, into at least two groups with different rates of sedimentation, a result which suggests that structural differences in the cells are of some significance in determining the rate of sedimentation.

It is suggested that the phenomena described result chiefly from variations in agglutination induced by a combination of the factors of salt concentration and of cell structure.

W. R. WOOLDRIDGE.

- I. STRANDSKOV, H. H. (1931). **A Statistical Study of the Relative Goodness of Fit of the Two Proposed Theories of Human Blood Group Inheritance.**—*J. Immunol.* **21**. 261-277. 10 tables. [31 refs.]
- II. JENKINS, R. L. (1931). **Random Mating and Blood Groups.**—*Ibid.* 279-286. 4 tables. [5 refs.]

I. The author outlines the two genetic theories that have been proposed as an explanation of the inheritance of human blood groups. PEARSON'S X^2 test is applied to the observed and calculated frequencies for 67 large populations, and the conclusion is reached that the theory of triple allelomorphs explains better the inheritance of human blood groups than does the two-factor hypothesis of VON DUNGERN and HIRZFELD whether or not the latter is complicated by linkage.

II. Attention is called to the assumption of the existence of random mating with regard to blood grouping. Whilst this may be so when one is dealing with a homogeneous racial group, it is pointed out that this may be false in some communities, and to such communities the application of the formulae p and q (the frequencies of occurrence of genes for agglutininogen A and agglutininogen B respectively among the population) are not suitable. It is proposed that, to eliminate such errors as selective mating which may take place in certain geographical areas, 1,000 people be grouped and that p by the X^2 test be made at least 0.15 before that group be considered satisfactorily classified.

R. LOVELL.

LUCKÉ, B., & McCUTCHEON, M. (1932). **The Living Cell as an Osmotic System and its Permeability to Water.**—*Physiol. Rev.* **12**. 68-139. 28 tables, 5 figs. [131 refs.]

The main problem discussed in the first part of this review is whether the exchange of water between the cell and its environment is subject to the laws of osmosis and diffusion. The authors conclude, after discussing much experimental and theoretical evidence, that the laws of AVOGADRO and of BOYLE are obeyed, when due allowance is made for material, such as "bound" water, which is not osmotically active. The law of CHARLES is not followed for with increase in temperature the volume of the cell decreases. This apparent deviation from the law may be accounted for primarily by the effect of temperature on the base-binding ability of the cell proteins. The kinetics of cellular osmosis are thoroughly discussed and several equations developed.

The second part of the review deals with the factors which modify cell permeability. Temperature appears to exert an effect somewhat in excess of that which would be expected from its effect on the purely physical process of diffusion. Cations tend to decrease cell permeability and anions to increase it and in both instances the effectiveness of the ion rapidly increases with its valence. The antagonism shown between cations of different valence, e.g. potassium and calcium, may be explained in terms of anion and cation antagonism. Fertilised cells have a greater permeability than normal cells, but this increased permeability can be prevented by anæsthetics and by cyanides. In low concentration, narcotics decrease permeability, but in high concentration they lead to cell damage and consequent increase in permeability.

W. R. WOOLDRIDGE.

LANDAUER, Walter. (1931). **Influence of Thallium Salts upon the Molting Mechanism of Fowls.**—*J. Agric. Res.* **43**. 67-72. 5 text figs. [3 refs.]

The author has tested the effect of thallium acetate, thallium fluoride, thallium sulphate and thallium carbonate upon fowls, by direct administration into the proventriculus. The drugs were given every other day to birds from four to five months old, and to chicks from two days old. The chicks died of chronic poisoning when 10 to 11 weeks old, but they could withstand much more thallium in proportion than the older birds and their plumage was not affected. The older birds showed a diffuse loss of feathers about the throat, breast, neck and head, this effect gradually disappearing in the female, but resulting in large bare areas in the male. Regeneration of feathers occurred, but occasionally the new feather sheaths were retained for some time. It is impossible to say definitely whether this effect is due directly to thallium, or to the action of the drug on the thyroid secretion, but the acetate proved the most and the carbonate the least active of the salts examined.

NORMAN HOLE.

TECHNIQUE.

OLITZKI, L., & GUREVITCH, J. (1932). Gewinnung von Blutkulturen bei Maltafieber. [The Obtaining of Blood Cultures in Malta Fever].—*Zlb. Bakt. I. (Orig.)*. **123**. 330-336.

This paper contains a further contribution to the question of the cultivation

of *Br. melitensis* having regard to the information contained in a previous publication by OLITZKI and BROMBERG [(1931). *Zlb. Bakt. I. (Orig.)*. **120**. 347.] concerning the phosphate requirements of the organism and the effect of the addition of cystin to the culture media.

The phosphate mixture which was added to the media contained 0.05 per cent. primary potassium phosphate and 0.15 per cent. secondary sodium phosphate.

It was found that the addition of this mixture increased the amount of growth, as did also the addition of cystin, but the addition of both together did not cause further improvement. The phosphate mixture was used in 0.2 per cent. strength and the cystin in 0.01 per cent. strength. Glycerin also increased the amount of growth.

Similar results were obtained with fluid or solid media. The effect of the addition of glycerin was more marked with the former. Cystin appeared to be less effective in liquid media than in solid media.

With these facts available, the authors proceeded to test the media by making cultures from the blood of undulant fever patients.

The destructive action of the serum on the bacteria in blood cultures can be prevented by the use of blood-clot without serum or by the addition of a small amount of defibrinated blood to a large amount of culture medium.

A. LESLIE SHEATHER.

REISINGER, L. (1931). Kurzer Ueberblick über die rektale Untersuchung beim Pferd. [**Short Review on Rectal Examination in the Horse**].—*Tierärztl. Rdsch.* **37**. 722-723 & 758-761. [20 refs.]

KADLETZ, M. (1931). Anatomische Grundlagen der rektalen Untersuchungen beim Rind. [**Anatomical Fundamentals in Rectal Examination in Cattle**].—*Deuts. tierärztl. Wschr.* **39**. 665-672. 3 figs. [numerous refs.]

MAGEE, L. M. (1932). **Vaginal and Rectal Exploration**.—*Vet. Rec.* **12**. 203-213.

The first two papers are on systematic lines and describe the abdominal and pelvic organs as they appear on rectal exploration. The three figures included in the second paper are valuable additions to the text.

The third paper treats the subject from a clinical point of view and deals with both horses and cattle. Much of the paper has an application to normal breeding and sterility in cows. It is followed by a general discussion by members attending the meeting.

J. T. E.

OFFICIAL AND OTHER REPORTS.

PAWLOFF, G., & KÄLOJANOFF, A. (1931). Die Errungenschaften des öffentlichen Veterinärwesens in Bulgarien. [**The Achievement of the Public Veterinary Service in Bulgaria**].—*Berl. tierärztl. Wschr.* **47**. 805-807 & 821-823.

This is a complete account of the entire veterinary organisation in Bulgaria and is set out under sectional headings.

I. LAND AND ORGANISATION.

Bulgaria extends over an area of over 104,000 square kilometres and has a total population of about five and a half million, of whom some four-fifths lead an agricultural life. The whole country is divided into 16 provinces, 91 areas and 2,660 districts. The vast majority of landowners are small holders. The animal population is approximately as follows:—482,000 horses, 212,000 mules and asses, 1,800,000 cattle (one-half cows or work oxen), 450,000 buffaloes (one-third draught animals), 8,700,000 sheep, 1,000,000 pigs and over 10,000,000 poultry. The entire veterinary profession is official and is under the control of the chief of the veterinary department of the ministry of agriculture (Prof. Dr. G. PAWLOFF). The laws governing the profession were passed in 1922 and 1924.

The scheme of arrangement is shown by graphs which are self-explanatory. Stated briefly, the central veterinary department has six main sections—devoted to contagious diseases, tuberculosis control, inspection of district veterinary surgeons, inspection of provincial veterinary surgeons, statistics and miscellaneous. There is a central veterinary bacteriological laboratory at Sofia which is divided into five departments.

An advisory committee of 14 persons is attached to the chief of the veterinary department.

Each province has a chief veterinary officer. In addition to a bacteriological laboratory, he controls the area veterinary officers in the province, an officer concerned entirely with tuberculosis control, a railway officer, and a frontier officer. The area veterinary officers in turn control the inspection of milk, markets and slaughterhouses which is carried out by appropriate subordinates.

At present there is a lack of district veterinarians and in places so affected veterinary supervision is carried out from the provincial office and individuals carry on multiple duties wherever necessary.

Reckoned from the provincial chief veterinary officers downwards, there are now 182 active veterinarians in Bulgaria: they are allocated as follows:—16 provincial chief veterinary officers, 70 area officers, 12 tuberculosis control officers, 75 district officers, 6 frontier and 3 railway officers. There are 40 area and 14 district veterinary officers, to which number must be added some 280 "Revierveterinärfeldscher," men with elementary veterinary education and survivors of the old régime which was put in force during Russian occupation.

The total number of all veterinarians in Bulgaria is about 600. This includes 30 army veterinary officers and 50 engaged in teaching.

The financial arrangements of the upkeep of the state veterinary service are described. The revenue comes from government grants and from a special levy on the agricultural community. The main heads of expense incurred by the veterinary department are also outlined.

II. CONTAGIOUS DISEASE CONTROL.

The following diseases are notifiable in Bulgaria:—rinderpest, contagious bovine pleuro-pneumonia, contagious pleuro-pneumonia of goats, anthrax, blackleg, sheep pox, glanders, dourine, swine fever, hæmorrhagic septicæmia, swine erysipelas, rabies, foot and mouth disease, tuberculosis, mange in horses, sheep and goats, piroplasmosis, fowl plague and fowl cholera.

All these diseases are properly controlled by the approved methods appropriate for each case. A brief note on the recent and present conditions in Bulgaria with respect to these diseases is given in the report.

Glanders has been eradicated by stringent control methods involving the expenditure of 35 million leva [about £50,000 at par] as compensation alone. Tuberculosis is controlled by a special veterinary section and tuberculosis-free areas are being rapidly increased. General tuberculin testing is employed in this work; all cows are tested annually and reactors removed. Anthrax was recently common in this country, but has been reduced to a small incidence by vaccination. Foot and mouth disease is of small importance and the number of fatal cases is less than 0.5 per cent. of all affected animals. Bulgarian cattle are very resistant to the disease and it is considered that there is no necessity to institute a slaughter policy. Bulgaria has been free from rinderpest and contagious bovine pleuropneumonia for several years. Caprine pleuro-pneumonia caused great losses between 1920 and 1925, but in the latter year it was eliminated by appropriate orders and by the use of neo-salvarsan. Sheep pox is being reduced by systematic vaccination, but is still common. Swine fever and swine plague have also been very considerably reduced: only 1,025 cases of these diseases were notified in 1928. Two main, including the central laboratory [*supra*], and 14 secondary veterinary bacteriological institutes play a very important part in disease control.

III. PROVINCIAL VETERINARY ORGANISATION.

Clinical veterinary surgery and medicine is also on a state basis and is performed by numerous clinics specially built for the purpose. In 1928, there were 366 large and small clinics in Bulgaria. The larger ones have specialists on their staffs and the smaller ones are run by district veterinary surgeons engaged in multifarious duties. The financial arrangements are very good both as to income and expenditure and the results are excellent for all concerned. The poorest animal owners obtain free treatment and a widespread insurance scheme is being developed.

IV. MUNICIPAL VETERINARY ORGANISATION.

The veterinary profession now has complete control of the inspection of all food materials of animal origin. Everything appertaining to this question is controlled; cattle houses, markets and slaughter houses must be built in an approved manner and when in regular use are under veterinary supervision. No private slaughter houses exist in Bulgaria. The financial support comes mainly from turnover percentages of the receipts from these premises and a certain part is set aside for the building of new markets, etc., until the whole country is adequately supplied with sufficient accommodation.

Appropriate milk inspection and supervision with laboratory assistance is also exercised.

J. T. E.